Genie TS Series™

Camera User's Manual

Genie TS Framework 1.20

sensors | **cameras** | frame grabbers | processors | software | vision solutions

P/N: CA-GENM-TSM00
www.teledynedalsa.com

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Teledyne DALSA is an international high performance semiconductor and electronics company that designs, develops, manufactures, and markets digital imaging products and solutions, in addition to providing wafer foundry services.

Teledyne DALSA Digital Imaging offers the widest range of machine vision components in the world. From industry-leading image sensors through powerful and sophisticated cameras, frame grabbers, vision processors and software to easy-to-use vision appliances and custom vision modules.

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Genie TS Series Overview

Description

The Genie TS, a member of the Genie camera family, provides a new series of affordable easy to use digital cameras specifically engineered for industrial imaging applications requiring embedded image processing and improved network integration. Genie TS provides features to increase dynamic range to ensure optimized image capture from a range of lighting conditions, features to cycle a user defined sequence of imaging setups, features to automatically adjust exposure and gain, image transfer-on-demand, plus both RS-485 and RS-232 ports, all part of a comprehensive camera package.

Genie cameras combine standard gigabit Ethernet technology (supporting GigE Vision 1.2 or 2.0 dependent on firmware) with the Teledyne DALSA Trigger-to-Image-Reliability framework to dependably capture and transfer images from the camera to the host PC. Genie TS cameras are available in a number of models implementing different sensors, image resolutions, and feature sets, either in monochrome or color versions.

Genie Application Advantages

- Optimized, rugged design
- GigE Vision 1.2 compliant, or version 2.0 compliant when using JPEG compression firmware
- Gigabit Ethernet (GigE) interconnection to a computer via standard CAT5e or CAT6 cables
- Supports connection to the host computer NIC through a GigE network switch
- Available in multiple resolutions, monochrome and color
- High frame rates with high resolutions
- 4 general purpose inputs with programmable threshold
- 4 general purpose outputs
- Counter, Timer, and Events available to support imaging applications
- Native Trigger-to-Image Reliability design framework
- Visual status LEDs on camera back plate
- Variety of internal test images for quick camera verification
- Supported by Sapera™ LT software libraries
- Supports both Power Over Ethernet (PoE) and auxiliary power input
- Refer to the Operation Reference and Technical Specifications section of the manual for full details

Features available now:

- Support for Metadata (Chunk mode)
- Digital binning for increased sensitivity (monochrome only)
- Multiple lookup table pre-processing for monochrome cameras
- Multiple real-time Flat Field processing available with image cycling (i.e. shading corrections)
- Dynamic defective pixel detection (replacement)
- Smoothing / Sharpening image filtering (monochrome only)
- High dynamic range support with a Multi-slope function
- Auto-Brightness (Auto-exposure, Auto-gain (AGC))
- Supports cycling multiple exposure times for sequential images. along with other parameters
- Multi-ROI supported in models TS-C1920 & TS-C2048 with firmware Ver. 1.12
- 1µs internal timer or external events can timestamp images
- Provides 2 User Settings sets to store and recall camera configurations
- RS-232 & RS-485 Serial Port Control
- UPNP support
- User memory available via FTP access
- Supports embedded JPEG image compression with user uploaded firmware
- Supports Fast acquisition via a streamlined user uploaded firmware
- Supports LUT for color versions
- Supports several trigger modes for image capture control

Features available with future firmware releases

- Auto-Brightness (Auto-Iris)
- Motorized Lens Zoom and Focus control
- Horizontal and Vertical Flip function
- Motion detection trigger mode for image capture
- Support of IEEE 1588 — Precision Time Protocol (PTP)

Genie Firmware Design Versions

New with the Genie Framework 1.20 release are user uploaded firmware design versions which enable Genie cameras with specific features to support a variety of embedded operations. The following table lists the Genie cameras available (updated for each release) with the firmware design versions supported by that model.

Firmware updates for all Genie TS models are available for download from the Teledyne DALSA web site [www.teledynedalsa.com/imaging/support/downloads]. Choose Genie TS Firmware from the available download sections, then choose the zip file download specific to your camera model. Update the camera firmware using CamExpert (see File Access via the CamExpert Tool).

Monochrome Camera	Sensor Model	Standard Design	JPEG Design	Fast Mode Design
TS-M4096	DALSA Vouvray	√	√	–
TS-M3500	DALSA Vouvray	√	√	–
TS-M2500	DALSA Vouvray	√	√	–
TS-M2048	CMOSIS cmv4000	√	√	√
TS-M1920	CMOSIS cmv2000	√	√	√
TS-M2560*	AnaFocus Lince5M	–	–	√
Color Camera				
TS-C4096	DALSA Vouvray	√	√	–
TS-C3500	DALSA Vouvray	√	√	–
TS-C2500	DALSA Vouvray	√	√	–
TS-C2048	CMOSIS cmv4000	√	–	–
TS-C1920	CMOSIS cmv2000	√	–	–

* All Genie TS models ship with the *Standard Design* firmware except for TS-M2560 which ships with the *Fast Mode Design*. Alternative firmware designs are easily downloaded from the Teledyne DALSA support web site.

Firmware Designs Overview

Standard Design

Encompasses all features released in previous framework versions along with new standard features available in framework 1.20 except for the specialized processing designs described below. This Design is GigE Vision 1.2 compliant and requires GigE Vision 1.2 or greater compliant GigE Vision host software.

JPEG Design

Camera firmware and feature set which supports the output of JPEG images, implemented on both monochrome and color cameras. This is an advanced processing design to provide JPEG image accelerated compression, maximizing frame rate transmission over Ethernet. This Design is GigE Vision 2.0 compliant and requires GigE Vision 2.0 or greater compliant host software.

Fast Mode Design

Camera firmware and feature set streamlined for accelerated acquisition speed. Specific models implement a newly offered sensor plus omit various processing features to achieve the Fast Mode Design goals. This Design is GigE Vision 1.2 compliant and requires GigE Vision 1.2 or greater compliant GigE Vision host software.

Semi Custom Designs

Available on demand, a variety of embedded processing or specialized function sets are possible for the Genie TS. As examples, possible designs include RRL, additional timers and counters, complex PLC functions, etc. Please contact your sales representative for information.

Part Numbers and Software Requirements

This manual covers the Genie TS monochrome and color models summarized below. This table groups models by color mode, resolution, and other physical parameters. New models area added to this manual as they are released by Teledyne DALSA. See "Camera Specifications" on page 12 for details of each Genie TS model.

Monochrome Camera	Resolution	Pixel size	Lens Mount	Product Number
TS-M4096	4096 x 3072	6.0 x 6.0 µm	M42 x 1mm treaded	G2-GM10-T4095
TS-M3500	3520 x 2200	6.0 x 6.0 µm	M42 x 1mm treaded	G2-GM10-T3505
TS-M2500	2560 x 2048	6.0 x 6.0 µm	M42 x 1mm treaded	G2-GM10-T2505
TS-M2048†	2048 x 2048	5.5 x 5.5 µm	(1-32 UN 2B) CS C	G2-GM10-T2041 G2-GM10-T2040
TS-M2048‡	2048 x 2048	5.5 x 5.5 µm	(1-32 UN 2B) CS C	G2-GM12-T2041 G2-GM12-T2040
TS-M1920†	1920 x 1080	5.5 x 5.5 µm	(1-32 UN 2B) CS C	G2-GM10-T1921 G2-GM10-T1920
TS-M1920‡	1920 x 1080	5.5 x 5.5 µm	(1-32 UN 2B) CS C	G2-GM12-T1921 G2-GM12-T1920
TS-M2560	2560 x 2048	5.0 x 5.0 µm	(1-32 UN 2B) CS	G2-GM10-T2561
Color Camera				
TS-C4096	4096 x 3072	6.0 x 6.0 µm	M42 x 1mm treaded	G2-GC10-T4095
TS-C3500	3520 x 2200	6.0 x 6.0 µm	M42 x 1mm treaded	G2-GC10-T3505
TS-C2500	2560 x 2048	6.0 x 6.0 µm	M42 x 1mm treaded	G2-GC10-T2505
TS-C2048	2048 x 2048	5.5 x 5.5 µm	(1-32 UN 2B) CS C	G2-GC10-T2041 G2-GC10-T2040
TS-C1920	1920 x 1080	5.5 x 5.5 µm	(1-32 UN 2B) CS C	G2-GC10-T1921 G2-GC10-T1920

† Standard Sensor
‡ Enhanced Sensor (NIR) — see Spectral Response M1920 & M2048

Genie Accessories & Cables (sold separately)	Order Number
M42 to Nikon F bayonet Adapter (see "M42x1 to Nikon F Bayonet Adapter" on page 154)	G2-AM42-MOUNT4
M42 to C-Mount Lens Adapter (see "M42x1 to C-Mount Adapter" on page 155)	G2-AM42-MOUNT0
Genie TS I/O and Power breakout cable (25-pin Micro-D type connector)	G2-IOPC-MD25F
Optical filters such as NIR/UV blocking filers are available from http://www.midwestopticalsystems.com/	

Teledyne DALSA Software Platform	
For Microsoft Windows: Genie TS Framework composed of the Sapera network Imaging Package and GigE Vision Imaging Driver.	Included with Genie TS distribution (via web download)
Alternative Genie TS Firmware Designs such as JPEG and Fast Mode.	Via web download
Sapera LT version 7.50 or later – supports all firmware designs (for Windows) includes Sapera Runtime and CamExpert Provides everything you will need to develop imaging applications Sapera documentation in compiled HTML help, and Adobe Acrobat® (PDF) formats.	Available for download http://www.teledynedalsa.com/mv/
Linux Package for Genie TS	Contact Teledyne DALSA Sales
Sapera Processing Imaging Development Library (available for Windows or Linux - sold separately):	Contact Teledyne DALSA Sales

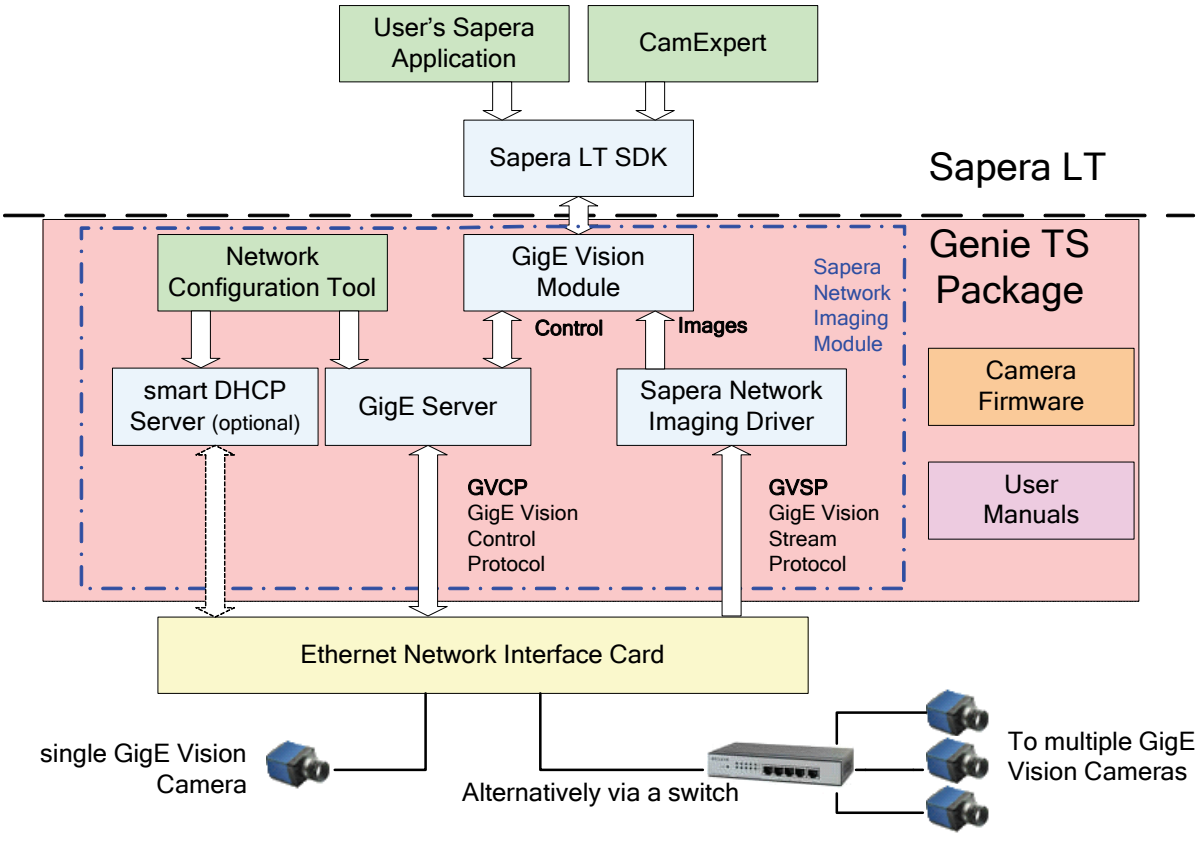
Third Party GigE Vision Software Platform Requirements	
Support of GenICam GenApi version 2.3	General acquisition and control
Support of GenICam GenApi version 2.3	File access: firmware, LUT, FFC, configuration data, upload & download
Support of GenICam XML schema version 1.1	
Support of GigE Vision 1.2	Includes Chunk Metadata support version 1.2 Applies to Standard and Fast firmware designs.
Support of GigE Vision 2.0	Jpeg payload type including chunk support with version 2.0. Applies to Jpeg firmware design.
GenICam™ support — XML camera description file	Embedded within Genie

GigE Vision Sapera Application Description

GiGE VISION®	Genie cameras are 100% compliant with the GigE Vision 1.2 and 2.0 specification which defines the communication interface protocol used by any GigE Vision device. The device description and capabilities are contained in an XML file. For more information see: http://www.machinevisiononline.org/public/articles/index.cfm?cat=167
GENICAM	Genie cameras implement a superset of the GenICam™ specification which defines device capabilities. This description takes the form of an XML device description file respecting the syntax defined by the GenApi module of the GenICam™ specification. For more information see www.genicam.org.

The Teledyne DALSA GigE Vision Module provides a license free development platform for Teledyne DALSA GigE hardware or Sapera vision applications. Additionally supported are Sapera GigE Vision applications for third party hardware with the purchase of a GigE Vision Module license, or the Sapera processing SDK with a valid license.

The GigE Vision Compliant XML device description file is embedded within Genie firmware allowing GigE Vision Compliant applications access to Genie capabilities and controls immediately after connection.



Camera Specifications Overview

Camera Controls	
Synchronization Modes	Free running, External triggered, Software trigger through Ethernet
Exposure Modes	Programmable in increments of 1µs minimum (in µs) is model specific maximum is 16 seconds Pulse controlled via Trigger pulse width.
Trigger Inputs	Opto-isolated, 2.4V to 24V typical, 16mA min. Debounce range from 0 up to 255 µs Trigger Delay from 0 to 2,000,000 µs
Strobe Outputs	Output opto-isolated: Aligned to the start of exposure with a programmable delay, duration and polarity (using "start of exposure on output line source" feature)
Auto-Iris Control	4-pin auto-iris connector compatible with common DC and video iris lens.
Features	
Flat Field Correction	2 Factory FFC plus 2 User Defined FFC (Standard Design Firmware)
3x3 Kernel Sharpening Filter	4 Predefined Selections (Monochrome models with Standard Design Firmware)
LUT	4 LUT available (monochrome models), 1 LUT (color models)
Binning	Digitally based: Horizontal (2 and 4 pixel) and Vertical (2 and 4 line) (monochrome models)
Gain	Analog (analog gain steps are model dependent) and Digital gain up to 4x
Counter and Timer	1 Counter, and 1 Timer. User programmable, acquisition independent, with event generation.
Timestamp	1µs internal timer or external signal to timestamp images and events
Metadata Support	Also know as Chunk Data Support in SFNC
Test image	Internal generator with choice of static and shifting patterns, or user defined patterns uploaded with the file access feature
User settings	Select factory default or either of two user camera configurations
Onboard Memory	
Minimum Reserved Data Buffer	256 MB
Reserved Packet Resend Buffer	24 MB default (user defined feature)
Reserved Private User Buffer	4 kB
Total Memory	512 MB
Back Focal Distance	
M42 x 1 mount models	12 mm
M42 to Nikon F bayonet adapter	46.5 mm (34.5 mm for the F mount adapter plus 12 mm for the camera body)
M42 to C-Mount adapter	17.52 mm (5.52 mm for the C mount adapter plus 12 mm for the camera body)
CS-mount models	12.52 mm (17.52 mm with a CS to C-mount adapter ring)
Mechanical Interface	
Camera Size	49(H) x 49(W) x 54(L) in mm, see "Mechanical Specifications" on page 153
Mass	196 g (no lens)
Power connector	via 25-pin Micro-D connector, or RJ45 in PoE mode
Ethernet connector	RJ45

Electrical Interface	
Input Voltage	+12 to +24 Volts DC (+20%/- 10%) at 0.6 Amp minimum Supports the Power Over Ethernet standard. (PoE Class 3 as per IEEE 802.3af)
Power Dissipation	< 6W (Vouvray and CMOSIS sensors), < 7W (AnaFocus sensor)
Operating Temperature	-20 to 60°C
Relative Humidity	5% to 90% non-condensing (operating)
Output Data Configuration	Gigabit Ethernet with PAUSE Frame support (as per IEEE 802.3x)
Data and Control	GigE Vision compliant

Specifications for each available sensor follow this section.

EMI, Shock and Vibration Certifications

Compliance Directives	Standards ID	Overview
CE	EN61000-4-2 : 2008	Electrostatic discharge immunity test
	EN61000-4-3 : 2006 A1 : 2007 A2 : 2010	Radiated, radio-frequency, electromagnetic field immunity test
	EN61000-4-4 : 2004	Electrical fast transient/burst immunity test
	EN61000-4-5 : 2005	Surge immunity
	EN61000-4-6 : 2008	Immunity to conducted disturbances, induced by radio-frequency fields
	EN61000-4-8 : 2009	Power frequency magnetic field immunity
	EN61000-4-11 : 2004	Voltage variations immunity
	EN61000-6-2 : 2005	Electromagnetic immunity
	EN61000-6-4: 2007	Electromagnetic emissions
	CISPR 11: 2009 A1 : group 1 FCC, part 15, subpart B:2010	Limit: class A Conducted Emissions
	CISPR 22 : 2008 Limit: class A	LAN port Conducted Emissions
FCC	Part 15, class A	
RoHS	Compliancy as per European directive 2004/105/EC	
For an image of Genie TS certificates see "EC & FCC Declarations of Conformity" on page 163		
Vibration & Shock Tests	**Test Levels (while operating)**	**Test Parameters**
Random vibrations	Level 1: 2 grms 60 min. Level 2: 4 grms 45 min. Level 3: 6 grms 30 min.	Frequency range: 5 to 2000 Hz Directions: X, Y, and Z axes
Shocks	Level 1: 20 g / 11 ms Level 2: 30 g / 11 ms Level 3: 40 g / 60 ms	Shape: half-sine Number: 3 shocks (+) and 3 shocks (-) Directions: ±X, ±Y, and ±Z axes
Additional information concerning test conditions and methodologies is available on request.		

Sensor Performance: TS-M4096, TS-C4096, TS-M3500, TS-C3500, TS-M2500, TS-C2500

The sensor description below (DALSA Vouvray models) provides a specification table and response graphics. The graph describes the sensor response to different wavelengths of light (excluding lens and light source characteristics). Visible light spans wavelengths between about 390 - 780 nanometers. Wavelengths below 390 nm are termed ultra-violet while those above 780 nm. are termed infra-red.

Sensor Specifications

Item / Feature	Specification
Camera Models	TS-M4096, TS-M3500, TS-M2500, TS-C4096, TS-C3500, TS-C2500
Sensor Used	Teledyne DALSA Vouvray
Minimum Frame Rate (internal acquisition)	0.1 fps (one frame every 10 seconds)
Maximum Frame Rate (internal acquisition)	Dependent on Genie TS model (written to internal memory) For STD and JPEG Designs: 12fps (4096), 19fps (3500), 29fps (2500)
Maximum Frame Rate Output	System dependent on the GigE network
Internal Exposure Control	19 µs to 16 sec. for timed exposure modes
External Exposure Control	External pulse width plus 19 µs (for TriggerWidth exposure mode)
Internal Trigger to Start of Exposure	106 µs minimum
End of Exposure to Readout	20 µs
Horizontal Line Time	26.125 µs (TS-M4096), 22.925 µs (TS-M3500), 16.525 µs (TS-M2500) 26.125 µs (TS-C4096), 22.925 µs (TS-C3500), 16.525 µs (TS-C2500)
Readout Time	Horizontal Line Time (max) x (lines in frame +1) *in µs*
Pixel Size	6.0µm x 6.0µm
Pixel Format	User selectable 8-bit or 10-bit
Shutter	Full frame electronic shutter
Sensor Gain Range	Default Gain value = 1.0, User selectable 0.7x (multi-slope only), 1.0x, 2.65x (will vary dependant on Black Level Offset setting)
Full Well Capacity	32ke (typical)
Output Dynamic Range † ‡	54.1 db (nominal gain, 8-bit buffer) 55.8 db (nominal gain, 10-bit buffer)
Signal to Noise ratio †† ‡	43.8 db (nominal gain, 8-bit buffer) 44.1 db (nominal gain, 10-bit buffer)
DN Variation	50% saturation: typical +/-4%
Responsivity	16 DN/(nJ/cm2) @ 560 nm (typical)

† Dynamic Range Test Conditions

- Analog Gain 1x
- Exposure 100µs
- All Corrections OFF

†† SNR Test Conditions

- Analog Gain 1x
- Exposure 1200µs
- Factory FFC Active and Defective Pixel Detection Active with threshold at 15%

‡ Specifications calculated according to EMVA-1588 standard, using white LED light

Sensor Cosmetic Specifications

The following table lists the current cosmetic specifications for DALSA Vouvray models TS-M4096, TS-M3500, TS-M2500, TS-C4096, TS-C3500, and TS-C2500.

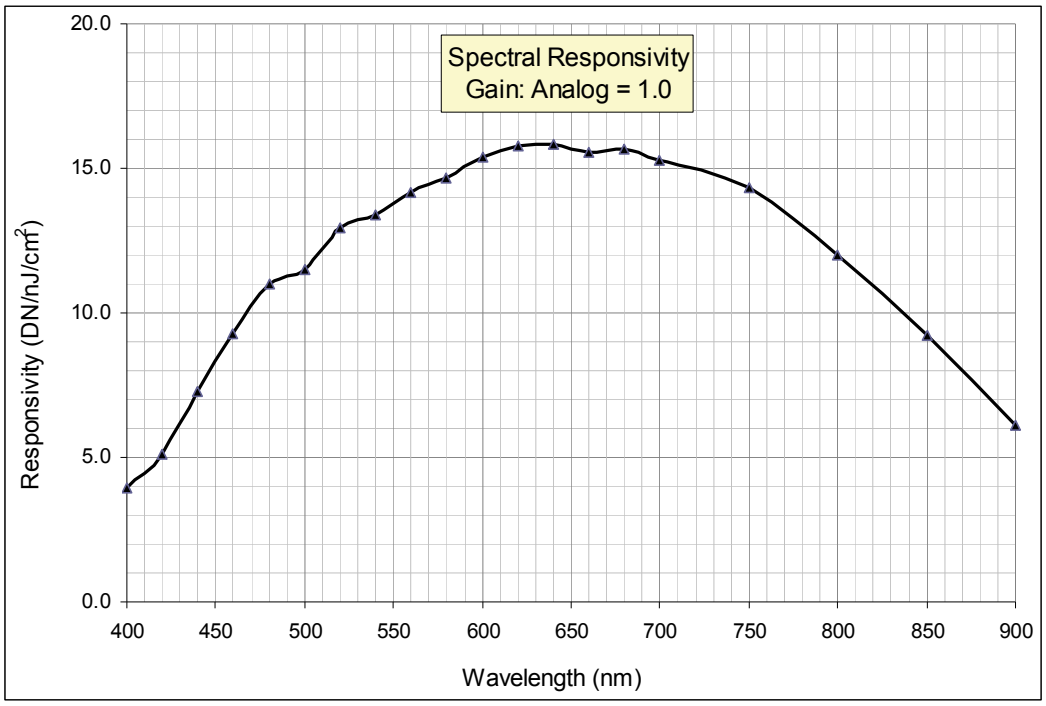
Blemish Specifications	Maximum Number of Defects	Blemish Description
Hot/Dead Pixel defects †††	Typical 0.015% Max 0.05%	Any pixel that deviates by ±20% from the average of neighboring pixels at 50% saturation including pixel stuck at 0 and maximum saturated value.
Spot defects	none	Grouping of more than 8 pixel defects within a sub-area of 3x3 pixels, to a maximum spot size of 7x7 pixels.
Clusters defects	none	Grouping of more than 5 single pixel defects in a 3x3 kernel.
Column defects	none	Vertical grouping of more than 10 contiguous pixel defects along a single column.
Row defects	none	Horizontal grouping of more than 10 contiguous pixel defects along a single row.

Note: All of the sensor cosmetic specifications are with factory flat-field correction (FFC) active. There are no pre-flat-field camera cosmetic specifications.

††† **Test conditions**

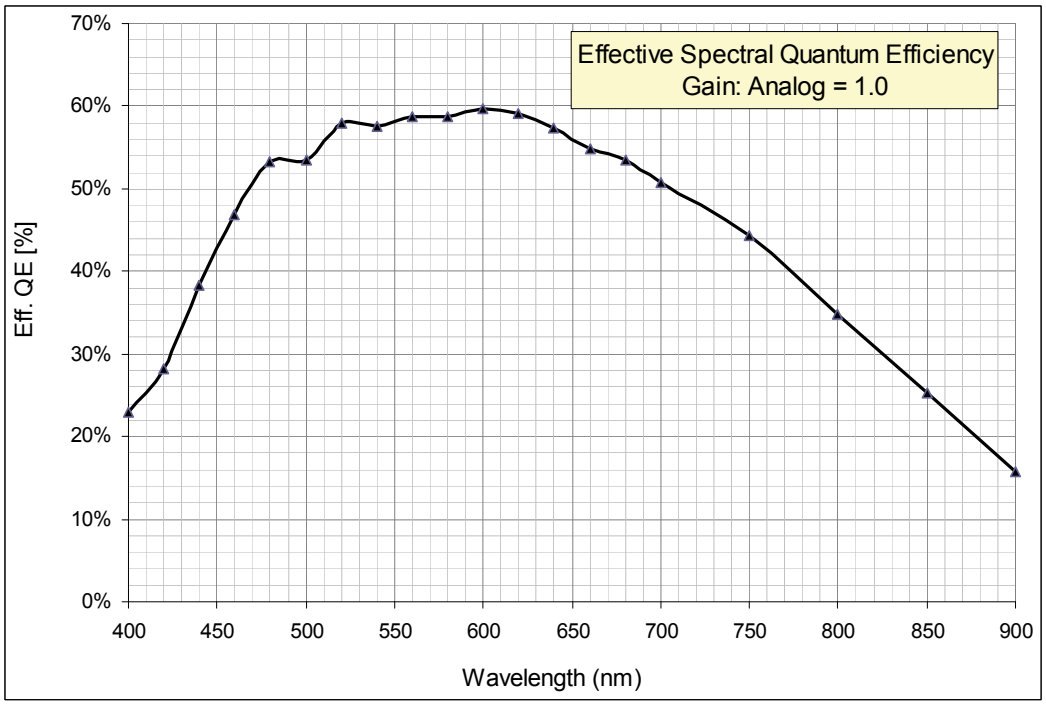
- Factory FFC Active
- Defective Pixel Detection OFF
- Nominal light = illumination at 50% of saturation
- Temperature of camera is 45°C

Spectral Responsivity: Monochrome

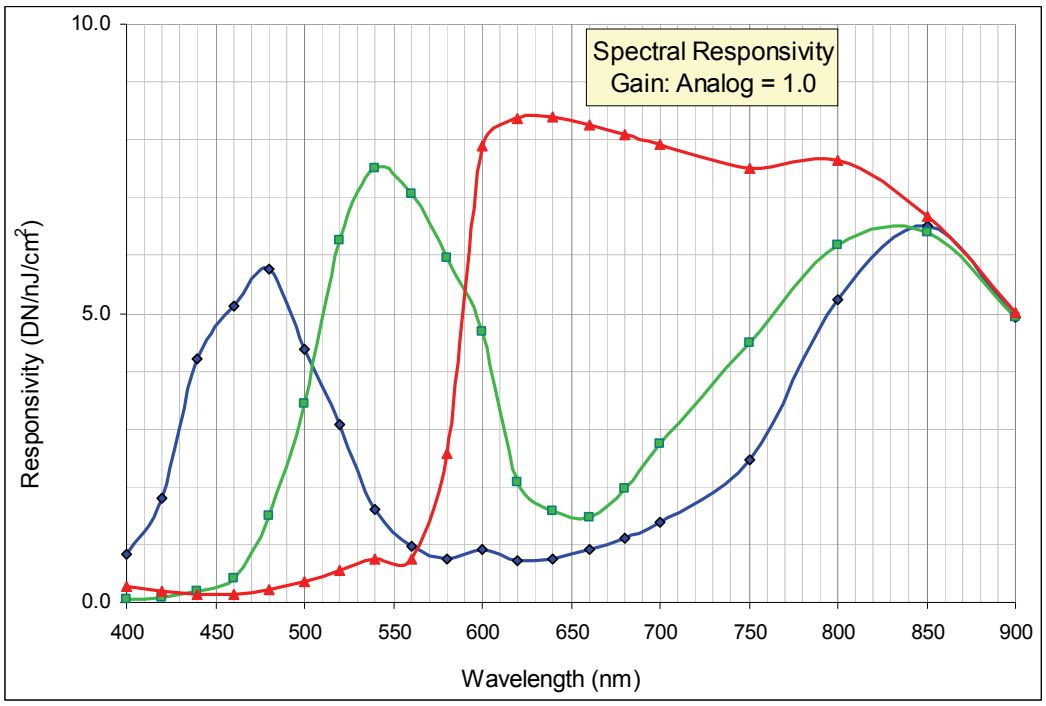


Effective Quantum Efficiency: Monochrome

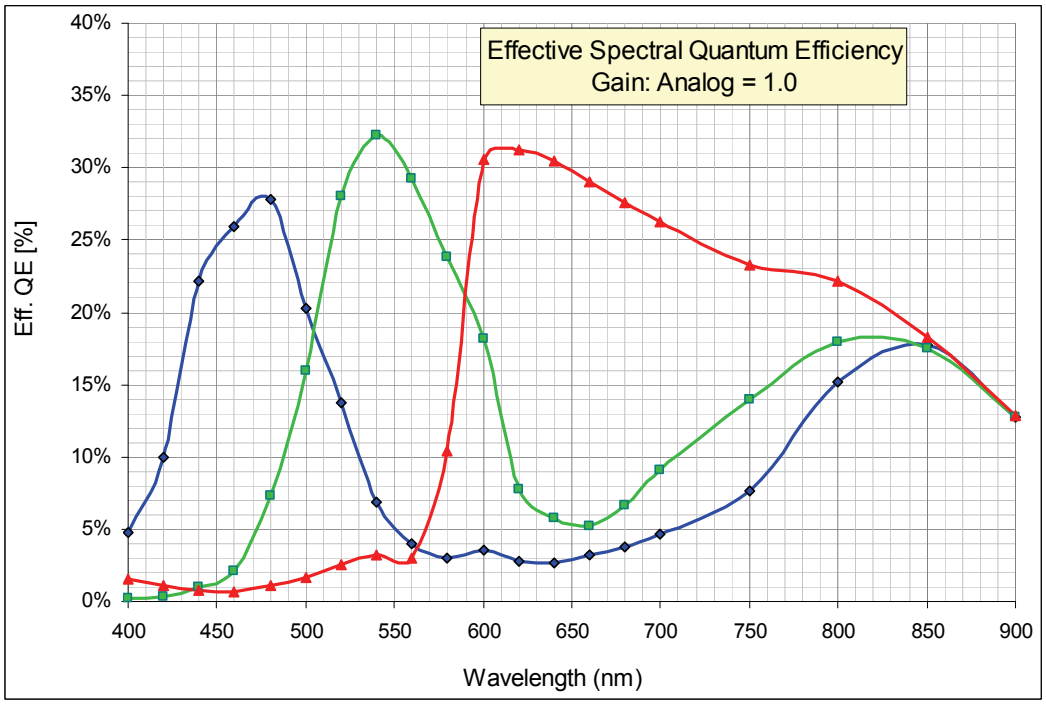
The quantum efficiency graph describes the fraction of photons at each wavelength that contribute charge to the pixel.



Spectral Responsivity: Color



Effective Quantum Efficiency: Color



An near infrared cutoff filter (~650nm) is recommended to obtain good visible light color separation when using light with an IR component. See IR Cutoff Filters.

Sensor Performance: TS-M1920, TS-C1920, TS-M2048, TS-C2048

The sensor description below (CMOSIS models) provides a specification table and response graphics. The graph describes the sensor response to different wavelengths of light (excluding lens and light source characteristics).

Sensor Specifications

Item / Feature	Specification
Camera Models & Sensor Used	TS-M2048, TS-C2048, (CMOSIS — CMV4000) TS-M1920, TS-C1920, (CMOSIS — CMV2000)
Minimum Frame Rate (internal acquisition)	0.06 fps (one frame every 16.6 seconds)
Maximum Full Frame Rate (internal acquisition)	(written to internal memory) with Standard & JPEG Design: 71 fps (TS-M1920), 37 fps (TS-M2048) with FAST Design: 142 fps (TS-M1920), 75 fps (TS-M2048)
Maximum Frame Rate Output	System dependent on the GigE network
Internal Exposure Control * using timed exposure modes	14 µs for Standard, JPEG Firmware, — all models 7 µs for Fast Design Firmware, — all supported models Maximum 16 sec. for all models and firmware.
Internal Trigger to Start of Exposure	0 µs
External Exposure Control	External pulse width plus 13 µs with Standard or JPEG Design Firmware External pulse width plus 6 µs with Fast Design Firmware
End of Exposure to Start of Readout	Standard Design: 44 µs (for TS-M1920, TS-M2048) FAST Design: 23 µs (for TS-M1920, TS-M2048)
Horizontal Line Time	Standard Design: 12.9 µs FAST Design: 6.5 µs
Readout Time	Horizontal Line Time (max) x (lines in frame) — *in µs*
Pixel Size	5.5 µm x 5.5 µm
Pixel Format	User selectable 8-bit or 10-bit
Shutter	Full frame electronic shutter
Sensor Analog Gain	Default Gain value = 1.2, User selectable 1.2x, 1.4x, or 1.6x
Full Well charge	11.25 ke typical with the default gain value of 1.2
Output Dynamic Range † ‡	57.1 db (nominal gain, 8-bit buffer) 59.7 db (nominal gain, 10-bit buffer)
Signal to Noise ratio †† ‡	38.8 db (nominal gain, 8-bit buffer) 38.9 db (nominal gain, 10-bit buffer)
DN Variation	50% saturation: typical +/-3.5%
Responsivity	see graphic: Spectral Response

† **Dynamic Range Test Conditions**

- Exposure 100µs
- 0% Full Light Level
- All Corrections OFF

†† **SNR Test Conditions**

- Exposure 600µs
- 80% Full Light Level
- FFC OFF (no factory FFC provided)
- Defective pixels replacement ON with 15%

‡ **Specifications calculated according to EMVA-1588 standard, using white LED light**

Sensor Cosmetic Specifications

Blemish Specifications	Maximum Number of Defects	Blemish Description
Hot/Dead Pixel defects †††	Typical 0.0025% Max 0.005%	Any pixel that deviates by ±20% from the average of neighboring pixels at 50% saturation including pixel stuck at 0 and maximum saturated value.
Spot defects	none	Grouping of more than 8 pixel defects within a sub-area of 3x3 pixels, to a maximum spot size of 7x7 pixels.
Clusters defects	none	Grouping of more than 5 single pixel defects in a 3x3 kernel.
Column defects	none	Vertical grouping of more than 10 contiguous pixel defects along a single column.
Row defects	none	Horizontal grouping of more than 10 contiguous pixel defects along a single row.

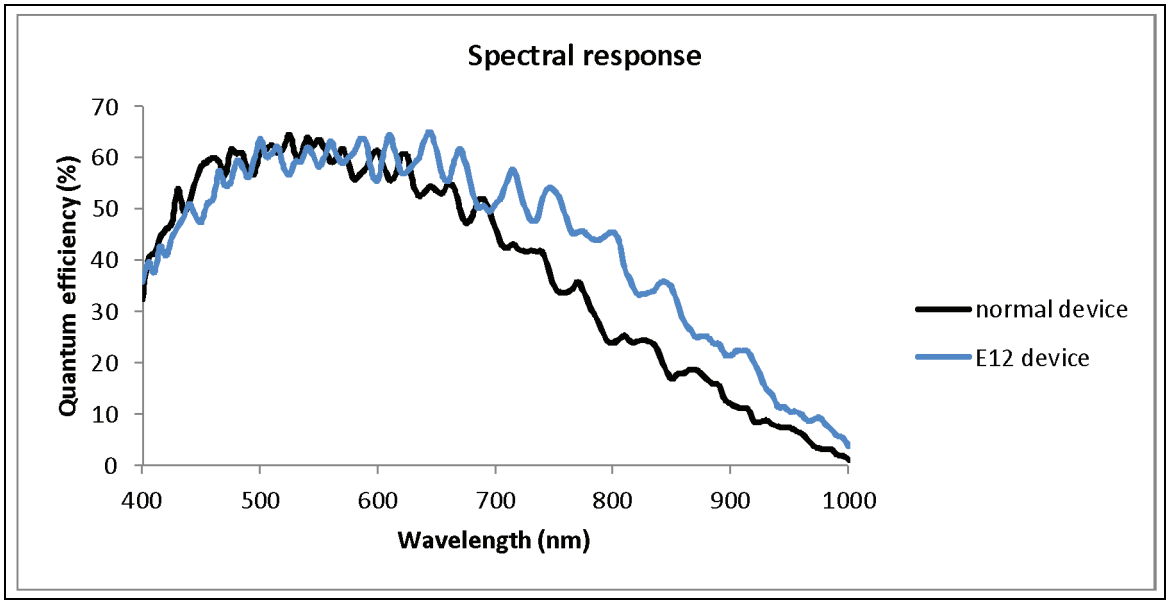
††† **Test conditions**

- FFC Off
- Defective Pixel Detection OFF
- Nominal light = illumination at 50% of saturation
- Temperature of camera is 45°C

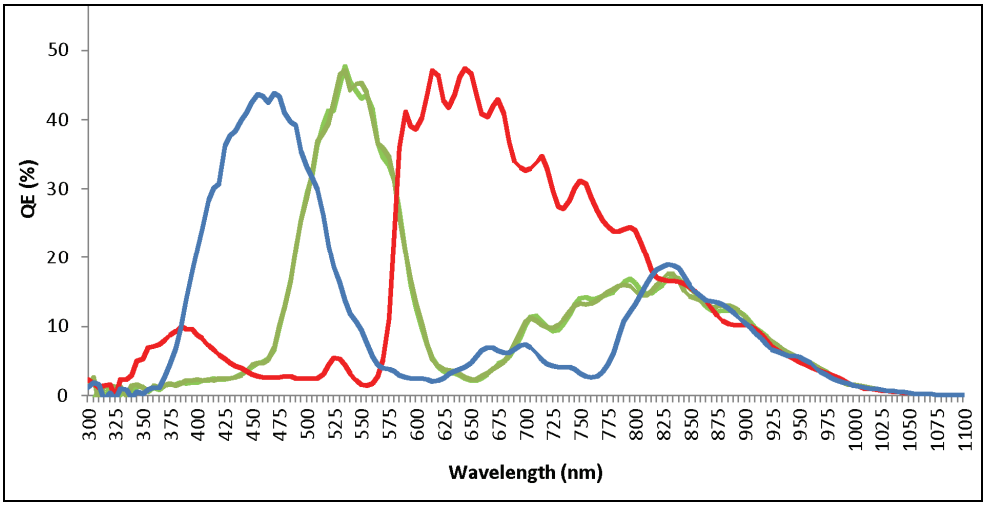
Spectral Response

Models TS-M1920 and TS-M2048 are each available in two versions as listed below. The normal version sensors are processed on 5µm epi-layer wafers while the E12 version sensors are processed on 12µm epi-layer wafers. As seen in the following graph, E12 sensors have an increased spectral response above 600nm.

- **5µm** epi-layer wafer models: G2-GM10-T1921 & G2-GM10-T2041
- **12µm** epi-layer wafer models: G2-GM12-T1921 & G2-GM12-T2041



Models TS-C1920 and TS-C2048 are the color versions standard monochrome versions.



An near infrared cutoff filter (~650nm) is recommended to obtain good visible light color separation when using light with an IR component. See IR Cutoff Filters.

Sensor Performance: TS-M2560

The sensor description below (AnaFocus models) provides a specification table and response graphics. The graph describes the sensor response to different wavelengths of light (excluding lens and light source characteristics).

Sensor Specifications

Item / Feature	Specification
Camera Models	TS-M2560
Sensor Used	Lince 5M
Minimum Frame Rate (internal acquisition)	0.06 fps — free-running (one frame every 16.6 seconds)
Maximum Frame Rate (internal acquisition)	51 fps (TS-M2560) (written to internal memory)
Maximum Frame Rate Output	System dependent on the GigE network
Internal Exposure Control	65 µs to 16 sec. for timed exposure modes
Internal Trigger to Start of Exposure	0 µs
External Exposure Control	External pulse width plus 27 µs (TS-M2560 TriggerWidth exposure mode)
End of Exposure to Start of Readout	63 µs (for TS-M2560)
Horizontal Line Time	12.9 µs
Readout Time	Horizontal Line Time (max) x (lines in frame) — *in µs*
Pixel Size	5 µm x 5 µm
Pixel Format	8-bit
Shutter	Full frame electronic shutter
Sensor Analog Gain	Default Gain value = 1.0 (user selectable 1x. 2x, 4x)
Full Well charge	18 ke (typical)
Output Dynamic Range † ‡	54.9 db (nominal gain, 8-bit buffer)
Signal to Noise ratio †† ‡	41.4 db (nominal gain, 8-bit buffer)
DN Variation	50% saturation: typical +/-3.5%
Responsivity	see graphic:

† Dynamic Range Test Conditions

- Exposure 100µs
- 0% Full Light Level
- All Corrections OFF

†† SNR Test Conditions

- Exposure 1225µs
- 80% saturation
- All Corrections ON (FPN auto-correction ON, On-sensor Pixel replacement ON (not the same as median filter)).

‡ Specifications calculated according to EMVA-1588 standard, using white LED light

Sensor Cosmetic Specifications

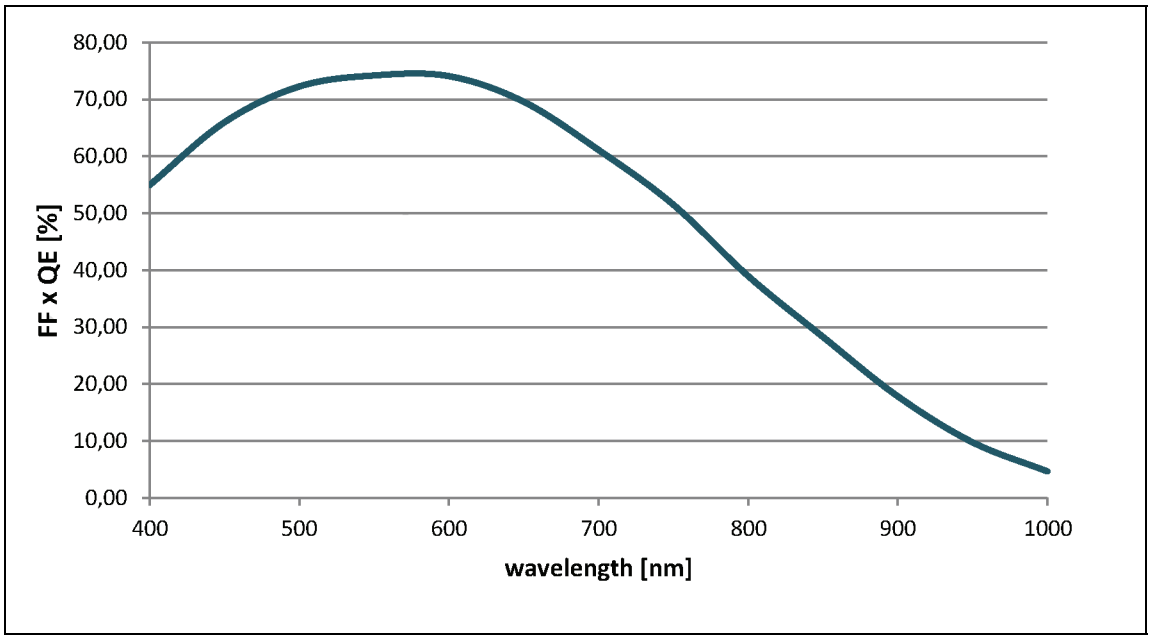
Blemish Specifications	Maximum Number of Defects	Blemish Description
Hot/Dead Pixel defects †††	Typical 0.0025% Max 0.005%	Any pixel that deviates by ±20% from the average of neighboring pixels at 50% saturation including pixel stuck at 0 and maximum saturated value.
Spot defects	none	Grouping of more than 8 pixel defects within a sub-area of 3x3 pixels, to a maximum spot size of 7x7 pixels.
Clusters defects	none	Grouping of more than 5 single pixel defects in a 3x3 kernel.
Column defects	none	Vertical grouping of more than 10 contiguous pixel defects along a single column.
Row defects	none	Horizontal grouping of more than 10 contiguous pixel defects along a single row.

††† **Test conditions**

- Defective Pixel Replacement ON
- Nominal light = illumination at 50% of saturation
- Temperature of camera is 45°C

Spectral Response

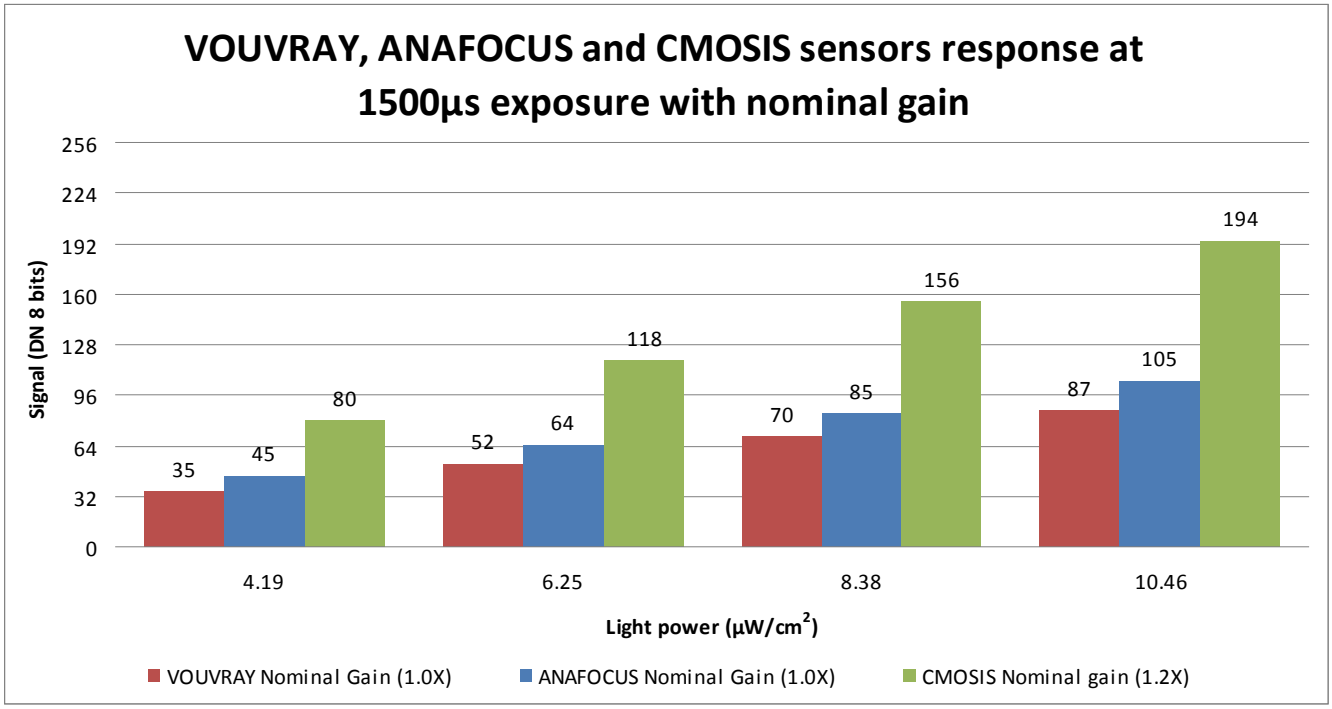
Model TS-M2560

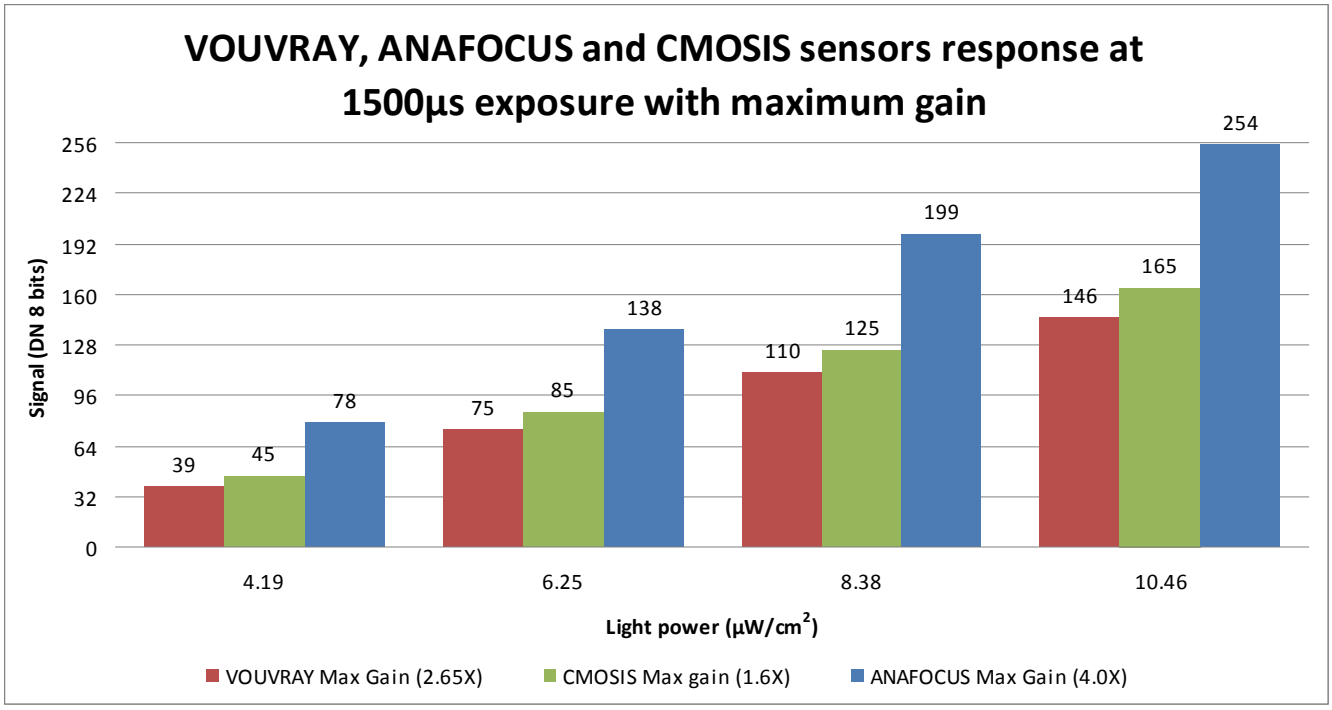


Measured Fill-Factor x Quantum Efficiency (FF x QE)

Sensor Relative Response: VOUVRAY vs. CMOSIS vs. AnaFocus

The following graphs show the relative sensitivity between sensors, for an equal exposure time and ignoring sensor signal noise. Two gain factors (nominal and maximum) were used as indicated.





Connecting the Genie TS Camera

GigE Network Adapter Overview

If the computer to be used with the Genie camera does not have a Gigabit network adapter or second built in Gigabit NIC, a Gigabit Network Interface adapter card (NIC) needs to be installed. Typically under Windows, the Gigabit NIC is recognized automatically when Windows boots.

With any high performance Gigabit NIC adapter, review the NIC documentation concerning any special driver required for your specific operating system. When adding a NIC adapter to a computer, Teledyne DALSA engineering has seen cases where a PCI Express bus Gigabit NIC has better overall performance than the same NIC hardware in PCI bus format.

PAUSE Frame Support

The Genie TS supports the Gigabit Ethernet PAUSE Frame feature as per IEEE 802.3x. PAUSE Frame is the Ethernet flow control mechanism that temporarily stops data transmission on the network. The PAUSE Frame feature can help a NIC that doesn't have enough buffering to handle full-speed reception. This requires that the flow control option in the NIC property settings and the Ethernet switch settings must be enabled.

Note that this problem is not as common with advances in computer bus speeds and memory sizes. PAUSE Frame support is typically required to manage network traffic within an Ethernet switch when multiple cameras are simultaneously used. Using PAUSE Frame will require the user to test various values of Jumbo Frames, to determine the best data throughput. Therefore the downside to managed network traffic is that the Pause Frame control will reduce the absolute maximum transfer bandwidth possible on the network.

Connect the Genie TS Camera

Connecting a Genie TS to a network system is independent to whether the Teledyne DALSA Sapera LT package or a third party GigE Vision development package is used.

- Before connecting power to the camera, test all power supplies. Power supplies must meet the requirements defined in section "Input Signals Electrical " on page 160. Apply power to the camera.
- Connect Genie to the host computer GigE network adapter or to the Ethernet switch via a CAT5e or CAT6 Ethernet cable. **Note:** cable should not be less than 1 meter (3 feet) long or more than 100 meters (328 feet) long.
- Once communication with the host computer is started the automatic IP configuration sequence will assign an LLA IP address as described in section "Genie IP Configuration Sequence" on page 27, or a DHCP IP address if a DHCP server is present on your network.
- Check the diagnostic LED which will be initially red then switch to flashing blue while waiting for IP configuration. See "Camera Status LED " on page 26 for Genie LED display descriptions.

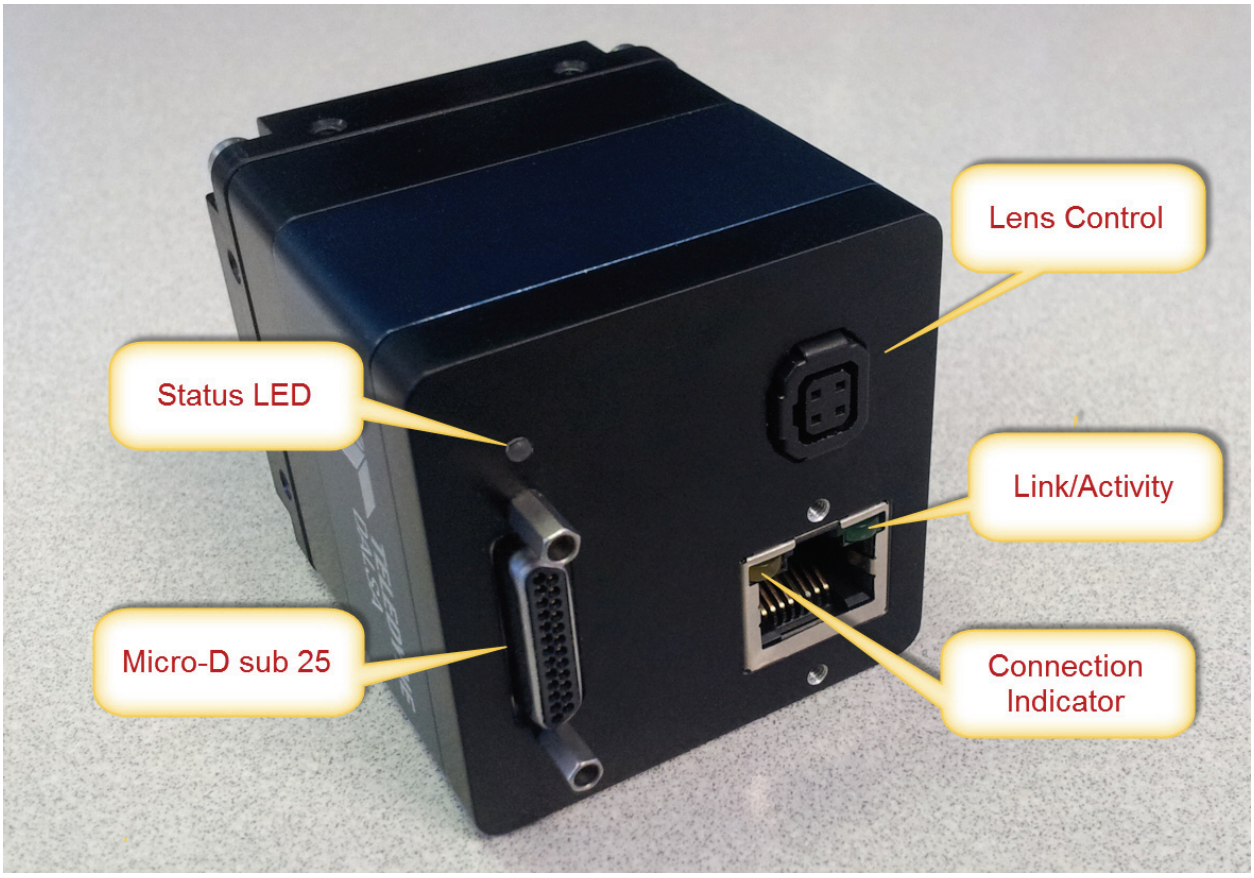
- The factory defaults for Genie is Persistent IP disabled and DHCP enabled with LLA always enabled as per the GigE Vision specification. For additional information see "Genie IP Configuration Mode Details" on page 150. See the next section "Connectors" on page 25 for an overview of the Genie interfaces.

Connectors

The Genie has three connectors:

- A single **RJ45 Ethernet** connector for control and video data transmitted to/from the host computer Gigabit NIC. The Genie TS also supports Power Over Ethernet (**PoE**). See "Ruggedized RJ45 Ethernet Cables" on page 173 for secure cables.
- A **Micro-D sub 25** connector for camera power (or auxiliary power), plus trigger, strobe and general I/O signals. Teledyne DALSA provides an optional breakout cable (part number G2-IOPC-MD25F). See "25-pin Micro-D type Connector Details" on page 158 for connector pinout specifications.
- A 4-pin auto-iris connector pinout compatible with common DC and video iris lens.

The following figure of the Genie back end shows connector and LED locations. See "Mechanical Specifications" on page 153 for details on the Genie connectors and camera mounting dimensions.



Genie – Rear View

LED Indicators

The Genie has one multicolor LED to provide a simple visible indication of camera state and the RJ45 Ethernet connector has two LEDs for network status conditions. These are described below.

Network Status Indicators

The Genie TS RJ45 Ethernet connector has two LEDS which display standardized information, defined as follows:

Ethernet Connector LEDs	Color	Description
Left LED (Connection indicator)	Amber	Connected to a network
	Off	Not Connected to a network
Right LED (Link/Activity indicator)	Green	Blinking – There is activity on the port
	Off	No data is currently being transferred

Camera Status LED Indicator

The camera is equipped with one LED to display the operational status of the camera. When more than one condition is active, the LED color indicates the condition with the highest priority (such as an acquisition in progress has more priority than a valid IP address assignment).

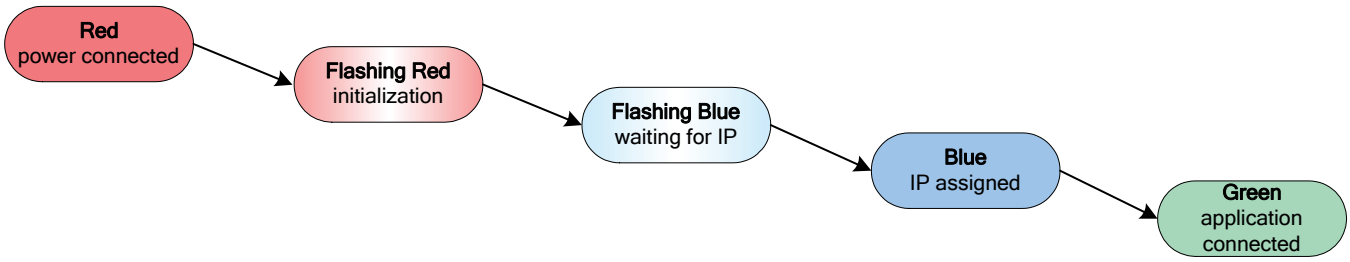
Once the Genie is connected to a network, the Status LED will turn to steady blue when the IP address is assigned. Only at this time will it be possible by the GigE Server or any application to communicate with the camera. The following table summarizes the LED states and corresponding camera status.

LED State	Definition
LED is off	No power to the camera
Steady Red	Initial state on power up before flashing. Remains as steady Red only if there is a fatal error. Camera is not initialized **
Flashing Red	Initialization sequence in progress
**	Wait a few minutes for the Genie to reboot itself.
Steady Red + Flashing Blue	Fatal Error. If the Genie TS does not reboot itself contact Technical Support.
Slow Flashing Blue	Ethernet cable disconnected. The camera continuously attempts to assign itself an IP address.
Fast Flashing Blue	File Access Feature is transferring data such as a firmware update, FCC or LUT transfer, etc.
Steady Blue	IP address assigned; no application connected to the camera
Steady Green	Application connected
Flashing Green	Acquisition in progress. Flashing occurs on frame acquisition but does not exceed a rate of 100ms for faster frame rates.

Note: Even if the Genie has obtained an IP address, it might be on a different subnet than the NIC it is attached to. Therefore, if the Genie LED is blue but an application can not see it, this indicates a network configuration problem. See the troubleshooting section in this manual.

LED States on Power Up

The following LED sequence occurs when the Genie is powered up connected to a network with installed Genie Framework software.



Genie IP Configuration Sequence

The Genie IP (Internet Protocol) Configuration sequence to assign an IP address is executed automatically on camera power-up or when connected to a network. As a GigE Vision compliant device, Genie attempts to assign an IP address as follows.

For any GigE Vision device, the IP configuration protocol sequence is:

- Persistent IP (if enabled)
- DHCP (if a DHCP server is present such as the Teledyne DALSA Smart DHCP server)
- Link-Local Address (always enabled)

The factory defaults for Genie is Persistent IP disabled and DHCP enabled with LLA always enabled as per the GigE Vision specification. For additional information see "Genie IP Configuration Mode Details" on page 150.

Supported Network Configurations

The Genie obtains an IP address using the Link Local Address (LLA) or DHCP, by default. A LLA IP address is obtained in about 6 seconds with Microsoft Vista/7 or in about 1 minute with Microsoft XP. If required, a persistent IP address can be assigned (see "Running the Network Configuration Tool" on page 33).

Preferably, a DHCP server is present on the network, where the Genie issues a DHCP request for an IP address. The DHCP server then provides the Genie an IP address. The Teledyne DALSA Network Configuration tool, installed with the Teledyne DALSA Network Imaging Package, provides a DHCP server which is easily enabled on the NIC used with the Genie TS (refer to the Teledyne DALSA Network Imaging Package user's manual).

The LLA method, if used, automatically assigns the Genie with a randomly chosen address on the 169.254.xxx.xxx subnet. After an address is chosen, the link-local process sends an ARP query with that IP onto the network to see if it is already in use. If there is no response, the IP is assigned to the device, otherwise another IP is selected, and the ARP is repeated. Note that LLA is unable to forward packets across routers.

Preventing Operational Faults due to ESD

Genie camera installations which do not protect against ESD (electrostatic discharge) may exhibit operational faults. Problems such as random packet loss, random camera resets, and random loss of Ethernet connections, may all be solved by proper ESD management.

The Genie camera when used with a simple power supply and Ethernet cable, is not properly connected to earth ground and therefore is susceptible to ESD caused problems. An Ethernet cable has no ground connection and a power supply's 0 volt return line is not necessarily connected to earth ground.

Teledyne DALSA has performed ESD testing on Genie cameras using an 8 kilovolt ESD generator without any indication of operational faults. The two following methods, either individually or together will prevent ESD problems.

- Method 1: Use a shielded power supply. The Genie case is now properly connected to earth ground and can withstand ESD of 8 kilovolts, as tested by Teledyne DALSA.
- Method 2: When using Power Over Ethernet (PoE), Teledyne DALSA strongly recommends using a shielded Ethernet cable to provide a ground connection from the controlling computer/power supply, to the Genie TS. PoE requires a powered computer NIC, or a powered Ethernet switch, or an Ethernet power injector.
- Method 3: Mount the camera on a metallic platform with a good connection to earth ground.

Using Genie TS with Sapera API

A Genie camera installation with the Teledyne DALSA Sapera API generally follows the sequence described below. Detailed installation instructions follow this overview.

Network and Computer Overview

- Genie needs to connect to a computer with a **GigE network adapter**, either built in on the computer motherboard or installed as a third party PCI adapter. See the previous section Connecting the Genie TS Camera.
- **Laptop computers** with built in **GigE network adapters** may still not be able to stream full frame rates from Genie, especially when on battery power. Thorough testing is required with any laptop computer to determine the maximum frame rate possible (refer to the Teledyne DALSA Network Imaging Package user's manual).
- Genie also can connect through a **Gigabit Ethernet switch**. When using VLAN groups, the Genie and controlling computer must be in the same group (refer to the Teledyne DALSA Network Imaging Package user's manual).
- If Genie is to be used in a **Sapera development environment**, Sapera LT needs to be installed, either before or after the Genie software package. If Genie will be used in a GigE Vision Compliant environment, Sapera or Sapera runtime is not required and you need to follow the installation instructions of the third party package.
- Install the **Genie Framework software package** if not using a third party GigE Vision compliant package. Also install **Sapera Run-time with CamExpert** to control the Genie.
- The **Windows Firewall** exceptions feature is automatically configured to allow the Sapera GigE Server to pass through the firewall.
- Computers with **VPN software** (virtual private network) may need to have the VPN driver disabled in the NIC properties. This would be required only on the NIC used with the Genie. Testing by the user is required.
- Once a Genie is connected, look at the small camera icon added to the Windows tray (next to the clock). Ensure the Genie camera has been found (right click the icon and select Status) Note that in Windows 7, the icon remains hidden until a camera is connected.
- A new Genie installation may require a firmware update. The File Selector feature is used to select a firmware file. See the CamExpert procedure "File Access via the CamExpert Tool" on page 148 for additional information.
- Use CamExpert (installed either with Sapera or Sapera runtime) to test the installation of the Genie camera. Set the Genie to internal test pattern. See "Internal Test Image Generator" on page 117.
- Set up the other components of the imaging system such as light sources, camera mounts, optics, encoders, trigger sources, etc. Test with CamExpert.

Sapera LT Library Windows Installation

	Note: to install Sapera LT and the Genie device driver, logon to the workstation as an administrator or with an account that has administrator privileges.

When Sapera application development is performed on the same computer that the Genie is connected to, the Sapera Development Library (version 7.20 or later, version 7.5 or later to support JPEG firmware acquisition decoding) must be installed. Else, Sapera LT SDK is not required to control the Genie camera.

- Download the Teledyne DALSA Sapera package or insert the Teledyne DALSA Sapera CD-ROM. Run the executable file to start the installation.
- The installation program will prompt you to reboot the computer.
- Continue with the Genie TS Framework Installation described next.

Refer to Sapera LT User's Manual concerning application development with Sapera.

Genie TS Framework Installation

The Genie TS Framework software package and Sapera runtime provides all components required to control the Genie with the supplied CamExpert tool. The Genie TS Framework includes the Network Imaging package (refer to the Teledyne DALSA Network Imaging package manual).

When using a third-party GigE Vision network driver, the Network Imaging package is not required unless you need to run CamExpert or require access to the Genie TS serial port controllers.

	Note: The Teledyne DALSA Sapera CamExpert tool (used throughout this manual to describe Genie TS GigE Vision features) is installed with either the Sapera LT runtime or the Sapera LT development package. If Sapera application development is required, install Sapera (7.50 or later for all firmware support) as described in the previous section.

Procedure

- Download the Genie TS Framework package and install the Genie Framework Software which includes the Network Imaging driver, and the Sapera GigE server.
- The procedure will prompt for acceptance of the installation folder for the Genie files.
- Optional: If the Teledyne DALSA Sapera LT SDK package is not used, click to install the Genie TS firmware and user manuals only. Follow the on screen prompts.

	Note: With some foreign language Windows there is a problem where the installation of a required filter driver does not proceed automatically. Until this issue is resolved by Teledyne DALSA engineering, follow the instructions in Appendix A: Framework Installation Issues with Foreign Language Windows.

Camera Firmware Updates or Changes

A Genie TS Framework installation includes the Standard (STD) camera firmware file.
The default folder path is as follows:

- `[]:\Program Files\Teledyne DALSA\Genie TS\Firmwares\*.cbf`

The user can upload new firmware using the File Access Control features as shown by CamExpert.

Alternative firmware designs are available to enable Genie TS cameras with specific features. See section Genie Firmware Design Versions for descriptions of the firmware design versions supported by various Genie TS models. The following table lists the current firmware file sets available for the various Genie TS models, and where the "xx" in the file name denotes the firmware build version. Current version firmware files are posted on the Teledyne DALSA support web site.

DALSA Vouvray models TS-M4096, TS-M3500, TS-M2500
GenieTS_Mono_Dalsa-5M_8M_12M_STD-Firmware_3CA10.xx.cbf
GenieTS_Mono_Dalsa-5M_8M_12M_JPEG-Firmware_3CA10.xx.cbf

DALSA Vouvray models TS-C4096, TS-C3500, TS-C2500
GenieTS_Color_Dalsa-5M_8M_12M_STD-Firmware_4CA10.xx.cbf
GenieTS_Color_Dalsa-5M_8M_12M_JPEG-Firmware_4CA10.xx.cbf

CMOSIS models TS-M2048, TS-M1920
GenieTS_Mono_Cmosis-2M_4M_STD-Firmware_5CA10.xx.cbf
GenieTS_Mono_Cmosis-2M_4M_JPEG-Firmware_5CA10.xx.cbf
GenieTS_Mono_Cmosis-2M_4M_FAST-Firmware_5CA10.xx.cbf

CMOSIS models TS-C2048, TS-C1920
GenieTS_Color_Cmosis-2M_4M_STD-Firmware_9CA10.xx.cbf

AnaFocus models TS-M2560
GenieTS_Mono_Anafocus-5M_FAST-Firmware_8CA10.xx.cbf

Application Development Header Files

Teledyne DALSA provides header files for developers managing Genie TS LUT data and chunk payload data as supported by GigE Vision 1.2. These files are installed by default in the folder ***[drv]:\Program Files\Teledyne DALSA\Genie TS\Developer Support Files***.

These files are:

- **dalsa_genie_lut.h**: Defines the structure for a user LUT data file.
- **dalsa_genie_chunk_payload.h**: Used to capture the raw fields of the extended chunk metadata from the stream.
- **dalsa_genie_chunk_extract.h**: This is passed the raw chunk data and fills in a data structure allowing access to the metadata parameters.

For information on extracting image metadata see "Extracting Metadata Stored in a Sapera Buffer" on page 122 in the Metadata Controls Category.

	Note: When developing applications without Sapera LT, request these header files from Teledyne DALSA.

GigE Server Verification

After a successful Genie TS Framework package installation, the GigE Server icon is visible in the desktop taskbar tray area (note that in Windows 7 the icon remains hidden until a camera is connected). After connecting a camera (see following section), allow a few seconds for the GigE Server status to update. The Genie camera must be on the same subnet as the NIC to be recognized by the GigE Server.

	Device Available	Device IP Error	Device Not Available
GigE Server Tray Icon:			
	The normal GigE server tray icon when the Genie device is found. It will take a few seconds for the GigE Server to refresh its state after the Genie has obtained an IP address.	The GigE server tray icon shows a warning when a device is connected but there is some type of IP error.	A red X will remain over the GigE server tray icon when the Genie device is not found. This indicates a major network issue. ***Or in the simplest case,*** the Genie is not connected.

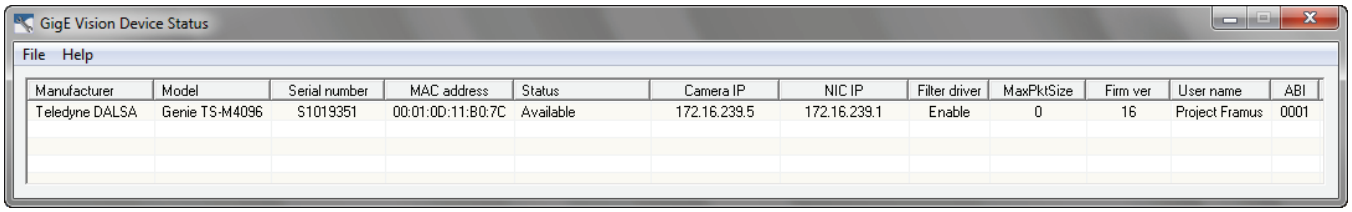
If you place your mouse cursor on this icon, the GigE Server will display the number of GigE Vision devices found by your PC. Right click the icon and select status to view information about those devices. See "Running the Network Configuration Tool" on page 33 and "Troubleshooting" on page 175for more information.

GigE Server Status

Once the Genie is assigned an IP address (its Status LED is steady blue) the GigE server tray icon will not have a red X through it, indicating that the Genie device was found. It might take a few seconds for the GigE Server to refresh its state after the Genie has obtained an IP address.

Right-click the GigE Server tray icon to open the following menu.

Click on Show Status to open a window listing all devices connected to the host system. Each GigE device is listed by name along with important information such as the assigned IP address and device MAC address. The screen shot below shows a connected Genie with no networking problems.


GigE Vision Device Status
File Help
Manufacturer Model Serial number MAC address Status Camera IP NIC IP Filter driver MaxPktSize Firm ver User name ABI
Teledyne DALSA Genie TS-M4096 S1019351 00:01:0D:11:B0:7C Available 172.16.239.5 172.16.239.1 Enable 0 16 Project Framus 0001

In the event that the device is physically connected, but the Sapera GigE Server icon is indicating that the connected device is not recognized, click Scan Network to restart the discovery process. Note that the GigE server periodically scans the network automatically to refresh its state. See "Troubleshooting" on page 175 for network problems.

Optimizing the Network Adapter used with Genie

Most Gigabit network interface controllers (NIC) allow user modifications to parameters such as Adapter Buffers and Jumbo Frames. These should be optimized for use with the Genie during the installation. Refer to the **Teledyne DALSA Network Imaging package manual** for optimization information.

Running the Network Configuration Tool

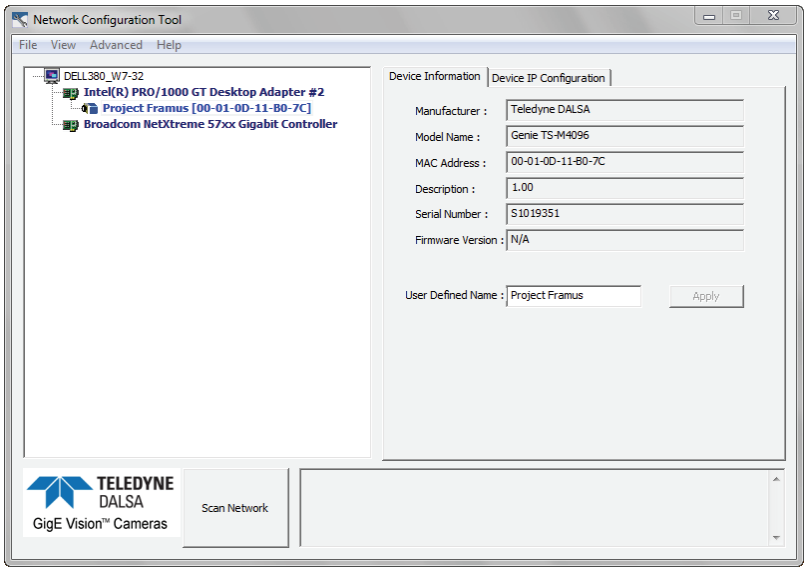
The Network Configuration tool provides information and parameter adjustments for network adapters installed in the system and any connected GigE Vision camera without use of any Windows Control Panel application. This tool allows you to:

- Activate the Network Imaging driver use for image acquisition on any NIC or disable the imaging driver for any NIC not used with a GigE Vision camera.
- Change the Auto Discovery Interval from the default of 15 seconds.
- Verify that the GigE Server is in the Windows firewall exception list.
- Configure the NIC and camera IP settings.
- Assign a User Defined name to a connected camera.
- Assign a Persistent IP address to a camera instead of the default DHCP/LLA assigned address.

- Easily Configure the NIC as a DHCP server for connected GigE Vision camera.

	Important: Changes made with this tool may update Genie parameters stored in flash memory. Do not remove power from the Genie camera for a minimum 10 seconds.

Refer to the **Teledyne DALSA Network Imaging Module** manual for more detailed information on using this tool. As shown below, the Network Configuration tool can quickly verify and modify the network configuration of the imaging system.



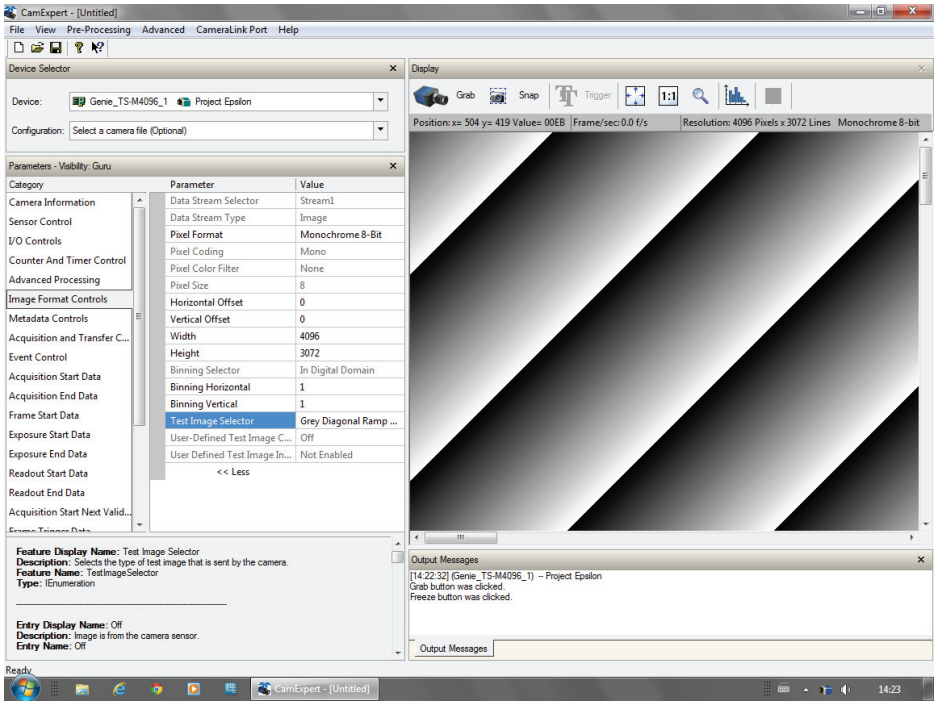
Run the tool from the Windows Start menu: Start•Programs•Teledyne DALSA Sapera Network Imaging Package•Dalsa Network Configuration Tool. Verify the camera appears as a child of the NIC card it is connected to. By default the Genie camera is identified by its serial number if no user defined name has been assigned.

Quick Test with CamExpert

When the Genie TS camera is connected to a Gigabit network adapter on a host computer, testing the installation with CamExpert is a straightforward procedure.

- Start Sapera CamExpert by double clicking the desktop icon created during the Genie software installation.
- CamExpert will search for installed Sapera devices. In the Device list area on the left side, the connected Genie camera is shown or will be listed in a few seconds after CamExpert completes the automatic device search (device discovery).
- Select the Genie camera device by clicking on the camera user defined name. By default the Genie camera is identified by its serial number. The Genie status LED will turn green, indicating the CamExpert application is now connected.
- Click on the Grab button for live acquisition (the Genie default is Free Running mode). Focus and adjust the lens iris. See "Operational Reference" on page 39 for information on CamExpert parameters with the Genie camera.

- If the Genie has no lens, just select one of the internal test patterns available (*Image Format Controls – Test Image Selector*). All but one are static images to use with the Snap or Grab function of CamExpert. The single "moving" test image is a shifting diagonal ramp pattern, which is useful for testing network/computer bandwidth issues. The CamExpert feature selection and the grabbed pattern are shown below.
- Note that CamExpert cannot be used to grab at high frame rates due to it generating an interrupt for each video frame. The Sapera Grab Demo tool is better suited for high frame rates.
- Refer to the Teledyne DALSA Network Imaging package manual if error messages are shown in the Output Messages pane. But first, increase the value of the Genie Interpacket Delay feature available from the GigE Vision Transport Layer Category group in CamExpert. An increase from default may correct errors with NIC interfaces that do not have adequate performance.



About the User Defined Camera Name

The Genie can be programmed with a user defined name to aid identifying multiple cameras connected to the network. For instance, on an inspection system with 4 cameras, the first camera might be labeled “top view”, the second “left view”, the third “right view” and the last one “bottom view”. The factory default user name is set to match the camera serial number for quick initial identification. Note that the factory programmed Genie TS serial number and MAC address are not user changeable.

When using CamExpert, multiple Genie TS cameras on the network are seen as different "Genie_TS-xxxxx" devices as an example. Non Teledyne DALSA cameras are labeled as “GigEVision Device”. Click on a device user name to select it for control by CamExpert.

An imaging application uses any one of these attributes to identify a camera: its IP address, MAC address, serial number or User Name. Some important considerations are listed below.

- Do not use the camera's IP address as identification (unless it is a persistent IP) since it can change with each power cycle.
- A MAC address is unique to a single camera, therefore the control application is limited to the vision system with that unique camera if it uses the camera's MAC address.
- The User Name can be freely programmed to clearly represent the camera usage. This scheme is recommended for an application to identify cameras. In this case, the vision system can be duplicated any number of times with cameras identified by their function, not their serial numbers or MAC address.

Silent Installation of Genie TS Framework

The Genie TS Framework installation can be integrated within a developer's installation procedure. The silent installation mode allows the Genie Framework installation to proceed without the need for mouse clicks from a user.

Two steps are required:

- Preparation of a response file to emulate a user.
- Invoking the Genie Framework installer with command options to use the prepared response file.

Creating the Response File

An installer response file is created by performing a Genie Framework installation with the command line switch "-r". The response file is automatically named setup.iss which is saved in the \windows folder. One simple method is to execute the Framework installer from within a batch file. The batch file will have one command line.

As an example, using the possible executable file name for the Framework, the command line is:

"Genie_TS_1.00.00.0000 Release.exe" –r

Important: The executable name is enclosed in quotation marks. This is required because of the space characters in the Genie Framework file name.

Running a Silent Mode Installation

A Genie Framework silent installation, whether done alone or within a larger software installation requires the Genie Framework executable and the generated response file setup.iss.

Execute the Framework installer with the following command line:

"Genie_TS_1.00.00.0000 Release.exe" -s -f1".\setup.iss"

where in this example, the switch –f1".\setup.iss" specifies that the setup.iss file is in the same folder as the Framework installer.

Windows Embedded 7 Installation

Windows Embedded 7 is not officially supported by Teledyne DALSA due to the number of possible configurations. However, Sapera LT and other Teledyne DALSA products should function properly on the Windows Embedded 7 platform provided that the required components are installed.

Teledyne DALSA provides answer files (.xml) for use during Windows Embedded 7 installation that install all necessary components for running Sapera LT 32-bit or 64-bit versions (SDK or Runtime), Sapera Processing 32-bit or 64-bit versions (SDK or Runtime), Teledyne DALSA framegrabbers or Genie GigE Vision devices.

For each platform (32 or 64-bit), the answer file is provided:

- SaperaGenie.xml: Configuration for Sapera LT, Sapera Processing and Teledyne DALSA Genie devices

These files are located in the following directories:

- <Install Directory>\Sapera\Install\Win7_Embedded\Win32
- <Install Directory>\Sapera\Install\Win7_Embedded\Win64

The OS footprint for these configurations is less than 1 GB. Alternatively, the Windows Thin Client configuration template provided by Microsoft in the Windows Embedded 7 installation also provides the necessary dependencies for Sapera LT, Teledyne DALSA framegrabbers and Genie devices (with an OS footprint of approximately 1.5 GB).

If you are installing other applications on the Windows Embedded 7 platform, it is recommended that you verify which components are required, and if necessary, create a corresponding Answer File.

For more information on performing dependency analysis to enable your application on Windows Embedded 7, refer to the Microsoft Windows Embedded 7 documentation.

Operational Reference

Using CamExpert with Genie TS Cameras

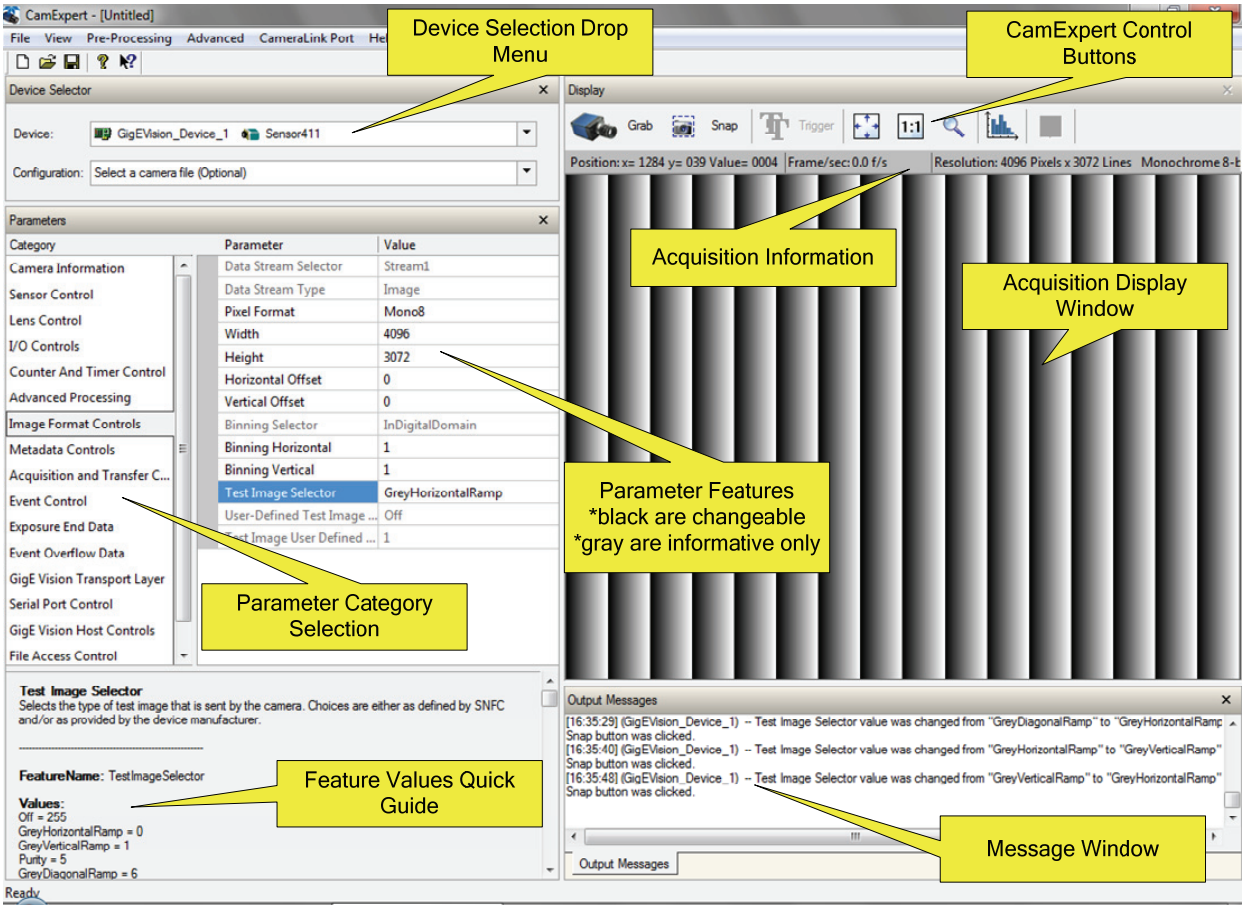
The Sapera CamExpert tool is the interfacing tool for GigE Vision cameras, and is supported by the Sapera library and hardware. When used with a Genie TS camera, CamExpert allows a user to test most of the operating modes. Additionally CamExpert saves the Genie user settings configuration to the camera or saves multiple configurations as individual camera parameter files on the host system (*.ccf).

An important component of CamExpert is its live acquisition display window which allows immediate verification of timing or control parameters without the need to run a separate acquisition program.

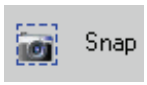
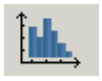
Click on any parameter and a short description is displayed below the Category pane. The same context sensitive help is available by clicking on the button then click on a camera configuration parameter. Click on the button to open the help file for more descriptive information on CamExpert.

CamExpert Panes

The various areas of the CamExpert tool are described in the summary figure below. GigE Vision device Categories and Parameter features are displayed as per the device's XML description file. The number of parameters shown is dependent on the View mode selected (Beginner, Expert, Guru – see description below).



- **Device pane**: View and select from any installed GigE Vision or Sapera acquisition device. After a device is selected CamExpert will only present parameters applicable to that device.
- **Parameters pane**: Allows viewing or changing all acquisition parameters supported by the acquisition device. CamExpert displays parameters only if those parameters are supported by the installed device. This avoids confusion by eliminating parameter choices when they do not apply to the hardware in use.
- **Display pane**: Provides a live or single frame acquisition display. Frame buffer parameters are shown in an information bar above the image window.
- **Control Buttons**: The Display pane includes CamExpert control buttons. These are:

	Acquisition control button: Click once to start live grab, click again to stop.
	**Single frame grab:** Click to acquire one frame from device.
	Software trigger button: With the I/O control parameters set to Trigger Enabled / Software Trigger type, click to send a single software trigger command.
	CamExpert display controls: (these do not modify the frame buffer data) Stretch (or shrink) image to fit, set image display to original size, or zoom the image to any size and ratio. Note that under certain combinations of image resolution, acquisition frame rate, and host computer speed, the CamExpert screen display may not update completely due to the host CPU running at near 100%. This does not affect the acquisition.
	**Histogram / Profile tool:** Select to view a histogram or line/column profile during live acquisition.

- **Output pane**: Displays messages from CamExpert or the GigE Vision driver.

CamExpert View Parameters Option

All camera features have a Visibility attribute which defines its requirement or complexity. The states vary from Beginner (features required for basic operation of the device) to Guru (optional features required only for complex operations).

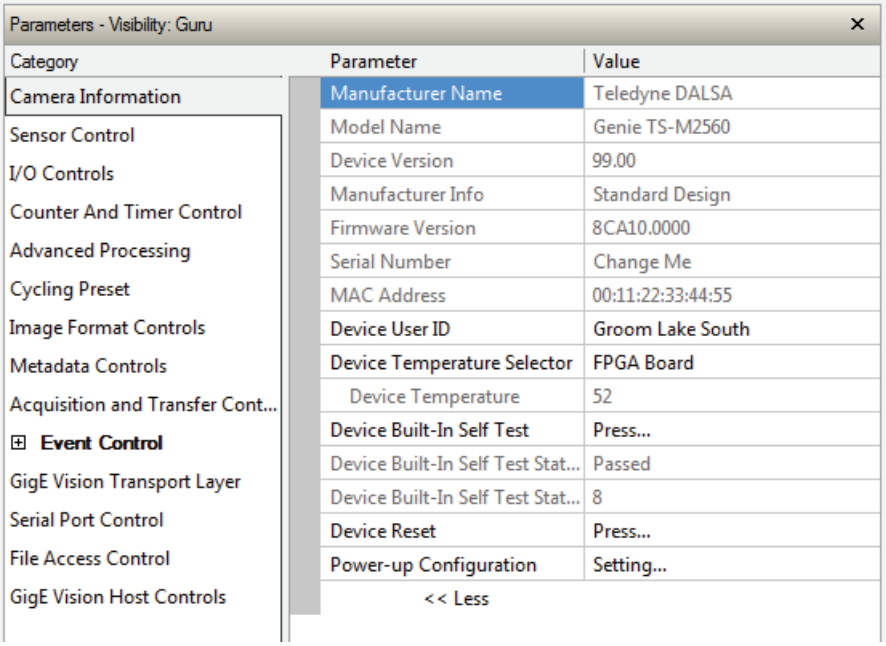
CamExpert presents camera features based on their visibility attribute. CamExpert provides quick Visibility level selection via controls below each Category Parameter list [<< Less More>>]. The user can also choose the Visibility level from the *View · Parameters Options* menu.

Camera Information Category

Camera information can be retrieved via a controlling application. Parameters such as camera model, firmware version, etc. are read to uniquely identify the connected Genie device. These features are typically read-only. GigE Vision applications retrieve this information to identify the camera along with its characteristics.

The Camera Information Category groups information specific to the individual GigE Vision camera. In this category the number of features shown are identical whether the view is Beginner, Expert, or Guru.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Camera Information Feature Descriptions

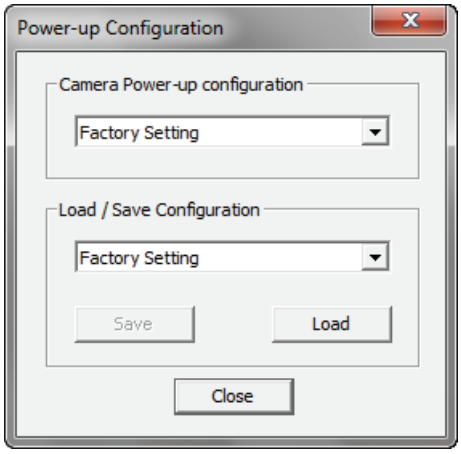
The following table describes these parameters along with their view attribute and in which device version the feature was introduced. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (using the tag **DFNC**), versus the GenICam Standard Features Naming Convention (SFNC not shown).

New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
Manufacturer Name	DeviceVendorName	Displays the device vendor name. (RO)	1.00 Beginner
Model Name	DeviceModelName	Displays the device model name. (RO)	1.00 Beginner
Device Version	DeviceVersion	Displays the device version. This tag will also highlight if the firmware is a beta or custom design. (RO)	1.00 Beginner
Manufacturer Info	DeviceManufacturerInfo	This feature provides extended manufacturer information about the device. Genie TS cameras show which firmware design is currently loaded. (RO)	1.00 Beginner
Firmware Version	DeviceFirmwareVersion	Displays the currently loaded firmware version number. Firmware files have a unique number and have the .cbf file extension. (RO)	1.00 Beginner
Serial Number	DeviceID	Displays the device's factory set camera serial number. (RO)	1.00 Beginner
MAC Address	deviceMacAddress	Displays the unique MAC (Media Access Control) address of the Device. (RO)	1.00 DFNC Beginner
Device User ID	DeviceUserID	Feature to store a user-programmable identifier of up to 15 characters. The default factory setting is the camera serial number. (RW)	1.00 Beginner
Device Temperature Selector	DeviceTemperatureSelector	Select the source where the temperature is read.	1.11 Beginner
FPGA Board	*FPGABoard*	*Read FPGA Board temperature*	
Sensor Board	*SensorBoard*	*Read Sensor Board temperature*	
Device Temperature	DeviceTemperature	The temperature of the selected source in degrees Celsius	1.11 Beginner
Power-up Configuration Selector	UserSetDefaultSelector	Selects the camera configuration set to load and make active on camera power-up or reset. The camera configuration sets are stored in camera non-volatile memory. (RW)	1.00 Beginner
Factory Setting	*Default*	*Load factory default feature settings.*	
UserSet1	*UserSet1*	*Select the user defined configuration UserSet 1 as the Power-up Configuration.*	
UserSet2	*UserSet2*	*Select the user defined configuration UserSet 2 as the Power-up Configuration.*	
User Set Selector	UserSetSelector	Selects the camera configuration set to load feature settings from or save current feature settings to. The Factory set contains default camera feature settings. (RW)	1.00 Beginner
Factory Setting	*Default*	*Select the default camera feature settings saved by the factory.*	
UserSet 1	*UserSet1*	*Select the User Defined Configuration space UserSet1 to save to or load from features settings previously saved by the user.*	
UserSet 2	*UserSet2*	*Select the User Defined Configuration space UserSet1 to save to or load from features settings previously saved by the user.*	
Load Configuration	UserSetLoad	Loads the camera configuration set specified by the User Set Selector feature, to the camera and makes it active. Can not be updated during a Sapera transfer. (W)	1.00 Beginner
Save Configuration	UserSetSave	Saves the current camera configuration to the user set specified by the User Set Selector feature. The user sets are located on the camera in non-volatile memory. (W)	1.00 Beginner

Device Built-In Self Test	deviceBIST	Command to perform an internal test which will determine the device status. (W)	1.00 DFNC Beginner
Device Built-In Self Test Status	deviceBISTStatus	Return the status of the device Built-In Self test. Possible return values are device-specific.	1.00 Beginner
Passed	*Passed*	*No failure detected*	
Firmware update failed	*FirmwareUpdateFailure*	*Last firmware update operation failed.*	
FPGA Cyclic Redundancy Check Failed	*FPGA_CRC_Failure*	*FPGA cyclic redundancy check failed.*	
Unexpected Error	*Unexpected_Error*	*Switched to recovery mode due to unexpected software error.*	
Device Built-In Self Test Status All	deviceBISTStatusAll	Return the status of the device Built-In Self Test as a bitfield. The meaning for each bit is device-specific.	1.10 DFNC Beginner
Device Reset	DeviceReset	Resets the device to its power up state. (W)	1.00 Beginner
Calibration Date	deviceCalibrationDateRaw	Date when the camera was calibrated.	1.11 DFNC Invisible
Device Acquisition Type	deviceAcquisitionType	Displays the Device Acquisition Type of the product. (RO)	1.00 DFNC Invisible
Sensor	*Sensor*	*The device gets its data directly from a sensor.*	
Device TL Type	DeviceTLType	Transport Layer type of the device.	1.20 Invisible
GigE Vision	*GigEVision*	*GigE Vision Transport Layer*	
Device TL Version Major	DeviceTLVersionMajor	Major version of the device's Transport Layer.	1.20 Invisible
Device TL Version Minor	DeviceTLVersionMinor	Minor version of the device's Transport Layer.	1.20 Invisible
DFNC Major Rev	deviceDFNCVersionMajor	Major revision of Dalsa Feature Naming Convention which was used to create the device's XML. (RO)	1.00 DFNC Invisible
DFNC Minor Rev	deviceDFNCVersionMinor	Minor revision of Dalsa Feature Naming Convention which was used to create the device's XML. (RO)	1.00 DFNC Invisible
SFNC Major Rev	DeviceSFNCVersionMajor	Major Version of the Standard Features Naming Convention which was used to create the device's XML. (RO)	1.00 Invisible
SFNC Minor Rev	DeviceSFNCVersionMinor	Minor Version of the Standard Features Naming Convention which was used to create the device's XML. (RO)	1.00 Invisible
SFNC SubMinor Rev	DeviceSFNCVersionSubMinor	SubMinor Version of the Standard Features Naming Convention which was used to create the device's XML. (RO)	1.00 Invisible

Camera Configuration Selection Dialog



CamExpert provides a dialog box which combines the features to select the camera power up state and for the user to save or load a camera state from Genie memory.

Camera Power-up Configuration

The first drop list selects the camera configuration state to load on power-up (see feature *UserSetDefaultSelector*). The user chooses from one factory data set or one of two possible user saved states.

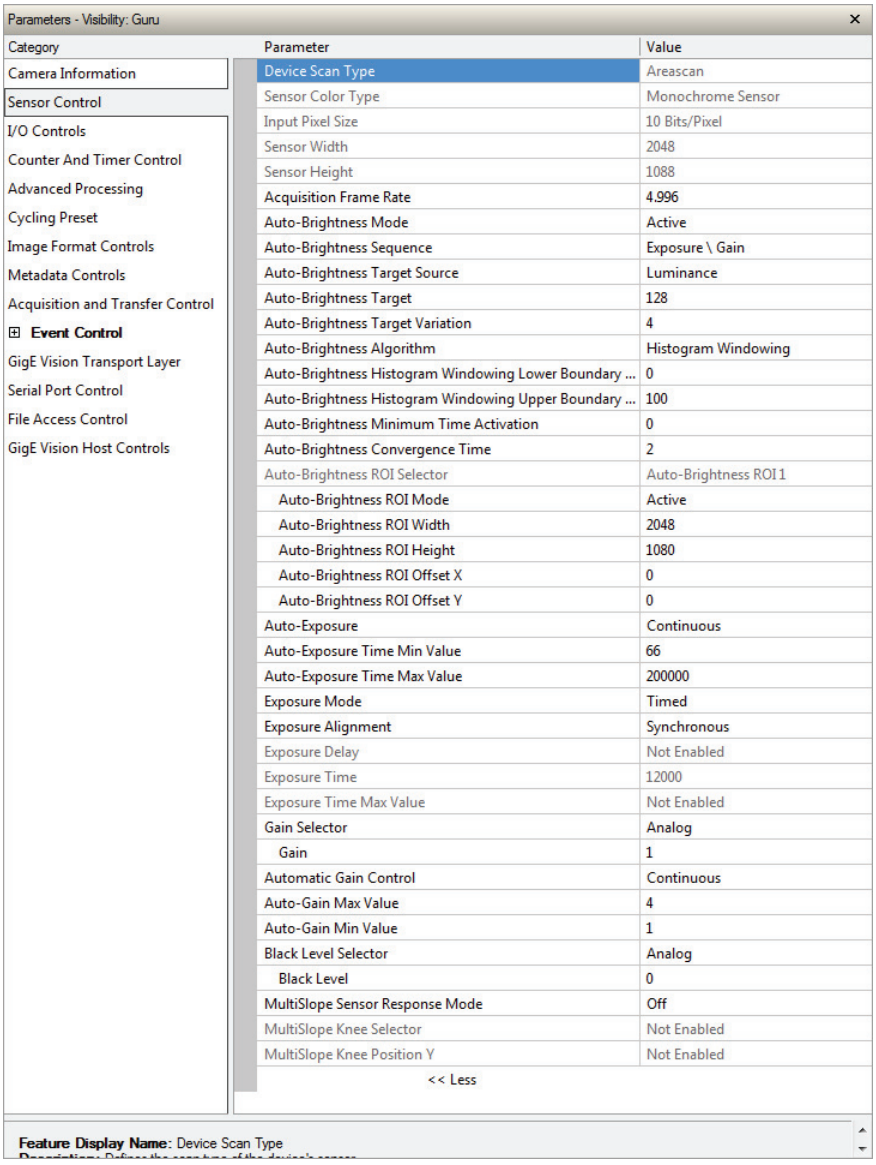
User Set Configuration Management

The second drop list allows the user to change the camera configuration anytime after a power-up (see feature *UserSetSelector*). To reset the camera to the factory configuration, select *Factory Setting* and click Load. To save a current camera configuration, select User Set 1 or 2 and click Save. Select a saved user set and click Load to restore a saved configuration.

Sensor Control Category

The Genie TS sensor controls, as shown by CamExpert, groups sensor specific parameters. This group includes controls for frame rate, exposure time, auto-brightness controls (exposure and gain), and the multi-slope function. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Sensor Control Feature Descriptions

The following table describes these features along with their view attribute and device framework version. For each feature the device version may differ for each camera sensor available and whether the camera is programmed with Standard firmware (STD), JPEG firmware (JPG), or Fast firmware (FST). Such differences will be clearly indicated for any applicable feature.

When a Device Version number is indicated, this represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

The first column indicates whether a feature applies to monochrome or color camera models via a symbol. No symbol indicates a common feature. Additionally the description column will indicate which feature is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

B/W Color	Display Name	Feature & Values	Description	Vouvray DALSA	CMOSIS CMV xx	AnaFocus Lince 5M
	Device Scan Type	DeviceScanType	Defines the scan type of the device's sensor. Genie TS is an Areascan camera. < RO, Beginner >	All Designs	All Designs	All Designs
	Areascan	*Areascan*	*Device uses an Areascan sensor.*			
	Sensor Color Type	sensorColorType	Defines the camera sensor color type. < RO, DFNC, Beginner >	all	all	
	Monochrome Sensor	*Monochrome*	*Sensor color type is monochrome.*			all
	Bayer Sensor	*CFA_Bayer*	*Sensor color type is Bayer Color Filter Array (CFA).*			
	Input Pixel Size	pixelSizeInput	Size of the image input pixels, in bits per pixel. < RO, DFNC, Guru >			
	8 Bits/Pixel	*Bpp8*	*Sensor output data path is 8 bits per pixel.*	—	—	FAST
	10 Bits/Pixel	*Bpp10*	*Sensor output data path is 10 bits per pixel.*	all	all	—
	Sensor Width	SensorWidth	Defines the sensor width in active pixels. < RO, Expert >	all	all	all
	Sensor Height	SensorHeight	Defines the sensor height in active lines. < RO, Expert >	all	all	all
	Acquisition Frame Rate	AcquisitionFrameRate	Specifies the camera internal frame rate, in Hz. Any user entered value is automatically adjusted to a valid camera value. Note that a change in frame rate takes effect only when the acquisition is stopped and restarted. < Beginner >	all	all	all
	Auto-Brightness Mode	autoBrightnessMode	Sets the mode for the Auto-Brightness function. < DFNC Expert >	V1.10 - all	all	all
	Off	*Off*	*Disable the auto-brightness mode.*			

	Active	*Active*	*Activates the auto-brightness mode when the AcquisitionStart or AcquisitionArm command is received.*			
	Auto-Brightness Sequence	autoBrightnessSequence	Specifies the processing order for the auto-brightness algorithm. Gain, Iris, and Exposure are adjusted sequentially, in the selected order, to achieve the auto-brightness target value. If the Iris, Gain, or Exposure features are not available or disabled, that feature is ignored in the processing sequence. < DFNC Expert >	V1.10 - all	all	all
	Exposure \ Gain	*Exposure_Gain_Iris*	*Adjust Exposure, Gain, Iris, in that order to achieve the auto-brightness target value.*			
	Gain \ Exposure	*Gain_Exposure_Iris*	*Adjust Gain, Exposure, Iris, in that order, to achieve the auto-brightness target value.*			
	Auto-Brightness Target Source	autoBrightnessTargetSource	Specifies the source image color plane(s) used by the Auto-Brightness algorithm to determine the brightness adjustment required to obtain the auto-brightness target value. < DFNC Expert >	V1.10 - all	all	
	Luminance	*Luminance*	*The luminance or Y component of the image is used as the auto-brightness target source.*			all
	Raw Bayer Pattern	*RawBayerPattern*	*The Raw Bayer Pattern of the image is used as the auto-brightness target source.*			—
	Auto-Brightness Target	autoBrightnessTarget	Sets the target image grayscale value, in DN, for the auto-brightness algorithm. Features that use auto-brightness include ExposureAuto, GainAuto, and IrisAuto. < DFNC Expert >	V1.10 - all	all	all
	Auto-Brightness Target Variation	autoBrightnessTargetRangeVariation	Sets the auto-brightness target Range Variation in (DN). An autoBrightnessTarget value within this range is considered valid and will not be compensated. < DFNC Expert >	V1.10 - all	all	all
	Auto-Brightness Algorithm	autoBrightnessAlgorithm	Specifies the auto-brightness algorithm used to calculate the brightness in the target image source plane(s). < DFNC Expert >	V1.10 - all		
	Average	*Average*	*The auto-brightness algorithm calculates the average luminance from the camera image and determines if the brightness should increase or decrease based on the requested target brightness.*		all	all
	Histogram Windowing	*HistogramWindowing*	*The auto-brightness algorithm calculates the histogram in every image from the camera and determines if the brightness should increase or decrease based on the requested target brightness.*		V1.11 – STD V1.20 - JPG	—
	Auto-Brightness Histogram Windowing Lower Boundary	autoBrightnessAlgoHistogram WindowingLowerBoundary	Specify the lower area boundary (in percent) of the histogram data range, used to reach the target value. < DFNC Expert >	V1.10 – STD	V1.11 – STD	—
	Auto-Brightness Histogram Windowing Upper Boundary	autoBrightnessAlgoHistogram WindowingUpperBoundary	Specify the upper area boundary (in percent) of the histogram data range, used to reach the target value. < DFNC Expert >	V1.10 – STD	V1.11 – STD	—

	Auto-Brightness Minimum Time Activation	autoBrightnessAlgoMinTimeActivation	Specifies the time delay between an image brightness change from the autoBrightnessTarget and when compensation of Gain/Exposure/Iris starts. This eliminates repetitive adjustments of short term brightness variations. < DFNC Expert >	all	all	all
	Auto-Brightness Convergence Time	autoBrightnessAlgoConvergenceTime	Specifies the approximate maximum time the autoBrightnessAlgorithm should take to compensate the image brightness as defined by the autoBrightnessTarget. Actual times typically are less but may be somewhat more. < DFNC Expert >	all	all	all
	Auto-Brightness ROI Selector	autoBrightnessROISelector	Selects the processing ROI for the Auto-Brightness algorithm. < DFNC Expert >	all	all	all
	Auto-Brightness ROI 1	*autoBrightnessROI1*	*ROI 1*			
	Auto-Brightness ROI Mode	autoBrightnessROIMode	Activates the ROI specified by the Auto-Brightness ROI Selector. When active, the Auto-Brightness algorithm limits analysis to this ROI image area to determine the auto-brightness adjustments. By default the Auto-Brightness ROI Mode is set to Off. < DFNC Expert >	all	all	all
	Off	*Off*	*The output image is used in the Auto-Brightness algorithm.*			
	Active	*Active*	*The selected ROI is used in the auto-brightness algorithm.*			
	Auto-Brightness ROI Width	autoBrightnessROIWidth	Specifies the ROI width for the currently selected Auto-Brightness ROI. < DFNC Expert >	all	all	all
	Auto-Brightness ROI Height	autoBrightnessROIHeight	Specifies the ROI height for the currently selected Auto-Brightness ROI. < DFNC Expert >	all	all	all
	Auto-Brightness ROI Offset X	autoBrightnessROIOffsetX	Specifies the ROI offset from the image origin along the X-axis for the currently selected Auto-Brightness ROI. < DFNC Expert >	all	all	all
	Auto-Brightness ROI Offset Y	autoBrightnessROIOffsetY	Specifies the ROI offset from the image origin along the Y-axis for the currently selected Auto-Brightness ROI. < DFNC Expert >	all	all	all
	Auto-Exposure	ExposureAuto	Sets the automatic exposure mode when the ExposureMode feature is set to Timed. < Expert >	all	all	all
	Off	*Off*	*Exposure duration is manually controlled using the ExposureTime feature.*			
	Continuous	*Continuous*	*Exposure duration is constantly adapted by the camera to meet the auto-brightness target pixel value. The initial starting exposure can be set by setting ExposureAuto to Off, changing the exposure time and then setting it back to Continuous.*			

	Auto-Exposure Time Min Value	exposureAutoMinValue	Sets the minimum exposure time value allowed by the user, in microseconds, for the Auto-Exposure function. < DFNC Expert >	all	all	all
	Auto-Exposure Time Max Value	exposureAutoMaxValue	Sets the maximum exposure time value allowed by the user, in microseconds, for the Auto-Exposure function. < DFNC Expert >	all	all	all
	Exposure Mode	ExposureMode	Sets the operation mode for the camera's exposure (or shutter). < Beginner >	all	all	all
	Timed	*Timed*	*The exposure duration time is set using the Exposure Time feature and the exposure starts with aFrameStart event.*			
	Trigger Width	*TriggerWidth*	*Uses the width of the trigger signal pulse to control the exposure duration. Use the Trigger Activation feature to set the polarity of the trigger. The Trigger Width setting is applicable with the Trigger Selector feature set to Framestart.* *Note that the Line Inverter feature setting may affect the polarity of the trigger signal and is only available when exposureAlignment = Reset.*			
	Exposure Alignment	exposureAlignment	Exposure Alignment specifies how the exposure is executed in relationship to the sensor capabilities and current frame trigger. < DFNC Beginner >	all	all	all
	Synchronous	*Synchronous*	*Exposure is synchronous to the internal timing of the sensor. The readout is concurrent to the exposure for the fastest possible frame rate. When a valid trigger is received and the ExposureTime is shorter than the readout period, the ExposureStart event is latched in the previous frame's readout. That is; the ExposureStartEvent is delayed and is initiated when the actual exposure starts such that the exposure ends and readout begins as soon as the previous readout has completed.*			
	Reset	*Reset*	*Sensor timing is reset to initiate exposure when a valid trigger is received. Readout is sequential to exposure, reducing the maximum achievable frame rates. That is, a trigger received during exposure or readout is ignored since data would be lost by performing a reset.*			
	Synchronous_EOE	*Synchronous_EOE*	*This mode is similar to the standard Synchronous mode described above. The difference being that this mode requires a continuous and fixed frequency trigger and is used with the Auto-Brightness or Auto-Exposure modes. The readout occurs only at the end of exposure. Use ExposureTimeMaxValue to define the maximum possible exposure time which is followed by the frame readout. This mode is used to synchronize readouts of multiple cameras having independent variable exposures.*			

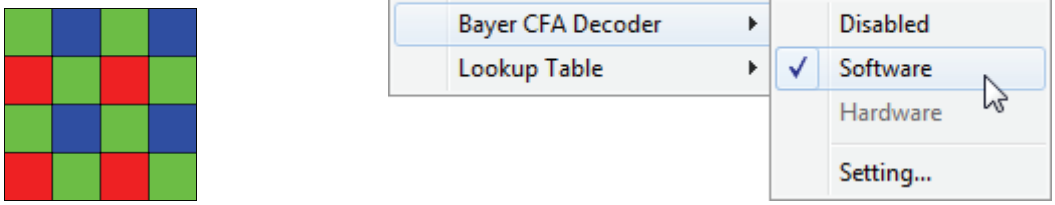
	Reset_EOE	*Reset_EOE*	*This mode is similar to the standard Reset mode described above. The difference being that this mode requires a continuous and fixed frequency trigger and is used with the Auto-Brightness or Auto-Exposure modes. The readout occurs only at the end of exposure. Use ExposureTimeMaxValue to define the maximum possible exposure time which is followed by the frame readout. This mode is used to synchronize readouts of multiple cameras having independent variable exposures.*			
	Exposure Delay	exposureDelay	Specifies the delay in microseconds (µs) to apply after the FrameStart event before starting the ExposureStart event. < DFNC Beginner >	all	all	all
	Exposure Time	ExposureTime	Sets the exposure time (in microseconds) when the Exposure Mode feature is set to Timed. < Beginner >	all	all	all
	Exposure Time Max Value	exposureTimeMaxValue	User set maximum exposure time possible between continuous triggers, when exposureAlignment is set to *Synchronous_EOE or Reset_EOE.* < DFNC Expert >	all	all	all
	Gain Selector	GainSelector	Selects which gain is controlled when adjusting gain features. < Beginner >	all	all	all
	Analog	*AnalogAll*	*Apply an analog gain adjustment within the sensor to the entire image.*			
	Digital	*DigitalAll*	*Apply a digital gain adjustment to the entire image.*			
	DigitalRed	*DigitalRed*	*Apply a digital gain adjustment to the red component.*	V1.20	V1.20	—
	DigitalGreen	*DigitalGreen*	*Apply a digital gain adjustment to the green component.*	V1.20	V1.20	—
	DigitalBlue	*DigitalBlue*	*Apply a digital gain adjustment to the blue component.*	V1.20	V1.20	—
	Gain	Gain	Sets the selected gain as an amplification factor applied to the image. < Beginner >	all	all	all
	Automatic Gain Control	GainAuto	Controls the state of the automatic gain control. < Beginner >	all	all	all
	Off	*Off*	*Gain is manually controlled using the Gain feature.*			
	Continuous	*Continuous*	*Gain is constantly adjusted by the camera to meet the auto-brightness target pixel value. The initial starting gain can be set by setting GainAuto to Off, changing the gain value and then setting it back to Continuous.*			
	Auto-Gain Max Value	gainAutoMaxValue	Sets the maximum gain multiplier value for the automatic gain algorithm. The automatic gain function is an amplification factor applied to the video signal to obtain the auto-brightness target value. < DFNC Expert >	all	all	all

	Auto-Gain Min Value	gainAutoMinValue	Sets the minimum gain multiplier value for the automatic gain algorithm. The automatic gain function is an amplification factor applied to the video signal to obtain the auto-brightness target value. < DFNC Expert >	all	all	all
	Black Level Selector	BlackLevelSelector	Selects which Black Level to adjust using the Black Level features. < Beginner >	all	all	all
	Analog	*AnalogAll*	*Sensor Dark Offset*			
	Black Level	BlackLevel	Controls the black level as an absolute physical value. This represents a DC offset applied to the video signal, in DN (digital number) units. The Black Level Selector feature specifies the channel to adjust. < Beginner >	all	all	—
	Auto-Black Level	BlackLevelAuto	Enable the automatic black level adjustment function and how it operates. < Expert >	—	—	V1.xx
	Off	*Off*	*Function Off*			
	On Demand	*OnDemand*	*Function operates on BlackLevelAutoOnDemandCmd*			
	Continuous	*Continuous*	*Function operates continuously*			
	Auto-black Level On-Demand Command	BlackLevelAutoOnDemandCmd	Enables an automatic black level adjustment process. < Expert >			V1.xx
	Automatic Black Level Calibration Status	BlackLevelAutoCalibrationStatus	Returns the current state of black level calibration. < Expert >	—	—	V1.xx
	Calibrated	*Calibrated*	*The black level is calibrated.*			
	UnCalibrated	*UnCalibrated*	*The black level is not calibrated.*			
	On-Sensor FPN Calibration Mode	OnSensorFpnCalibrationMode	Activation mode for the On-Sensor Fixed Pattern Noise Calibration function. < Expert >	—	—	V1.xx
	Off	*Off*	*FPN calibration Off*			
	On Demand	*OnDemand*	*FPN calibration On Demand*			
	Continuous	*Continuous*	*FPN calibration Continuous*			
	On-Sensor FPN Calibration On-Demand Comand	OnSensorFpnCalibrationOnDemandCmd	Enable an automatic On-Sensor Fixed Pattern Noise Calibration process. < Expert >			V1.xx
	On-Sensor FPN Calibration Status	OnSensorFpnCalibrationStatus	Returns the current state of the fixed pattern noise calibration process. < Expert >	—	—	V1.xx
	Calibrated	*Calibrated*	*The fixed pattern noise is calibrated*			
	UnCalibrated	*UnCalibrated*	*The fixed pattern noise is not calibrated*			
	MultiSlope Sensor Response Mode	multiSlopeSensorResponseMode	Sets the enable state of the multi-slope response mechanism on the sensor. < DFNC Expert >	V1.10 - STD	all	—
	Off	*Off*	*Disable the MultiSlopeSensorResponseMode feature.*			

	Active	*Active*	*Enable the MultiSlopeSensorResponseMode feature.*			
	MultiSlope Knee Selector	multiSlopeKneeSelector	Selects which multi-slope knee position to set. < DFNC Expert >	V1.10 - STD	all	—
	Knee Point 1	*KneePoint1*	*Selects the first knee point.*			
	Knee Point 2	*KneePoint2*	*Selects the second knee point.*			
	MultiSlope Knee Position X	multiSlopeKneePositionX	Sets the Multi-Slope Knee position as a % of the exposure time. < DFNC Expert >	V1.10 - STD	all	—
	MultiSlope Knee Position Y	multiSlopeKneePositionY	Sets the Multi-Slope Knee position as a % of the saturated luminance output. < DFNC Expert >	V1.10 - STD	all	—
	Acquisition Frame Rate (Raw)	AcquisitionFrameRateRaw	Controls the desired frame rate of the camera in .001 Hz. < Invisible >	all	all	all
	Black Level RAW	BlackLevelRaw	Controls the black level as an absolute physical value. < Invisible >	all	all	—
	Auto-Brightness Algorithm Source	autoBrightnessAlgoSource	Specifies the source location of the Auto-Brightness algorithm. < Invisible >	all	all	all
	Local	*Local*	*The auto-brightness algorithm runs in the camera.*			
	Ethernet	*Host*	*The auto-brightness algorithm runs on a host machine via the Ethernet connection.*			
	DEV - Auto-Brightness Algorithm IP Address	autoBrightnessAlgoHostIPAddress	Host computer IP address where the algorithm TCP server is run. < Invisible >	all	all	all
	DEV - Auto-Brightness Algorithm IP Port	autoBrightnessAlgoHostIPPort	Host computer IP port where the algorithm TCP server is run. < Invisible >	all	all	all

Bayer Mosaic Pattern

The Genie TS Color camera outputs raw Bayer image data using the mosaic pattern shown below. Teledyne DALSA Sapera CamExpert tool interprets the raw Bayer output when the user enables the Pre-Processing Software Bayer Decoder.



Bayer Mosaic Pattern and the CamExpert processing function to decode the Genie TS Color

Gain and Black Level Control Details

The Genie TS series of cameras provide gain and black level adjustments. Dependent on the model of camera, adjustments are available at the sensor as an analog variable and/or in the digital domain. The gain and black level controls can make small compensations to the acquisition in situations where lighting varies and the lens iris can not be easily adjusted. Optimal gain and black level adjustments maximizes the Genie TS dynamic range for individual imaging situations. The user can evaluate Gain and Black Level by using CamExpert.

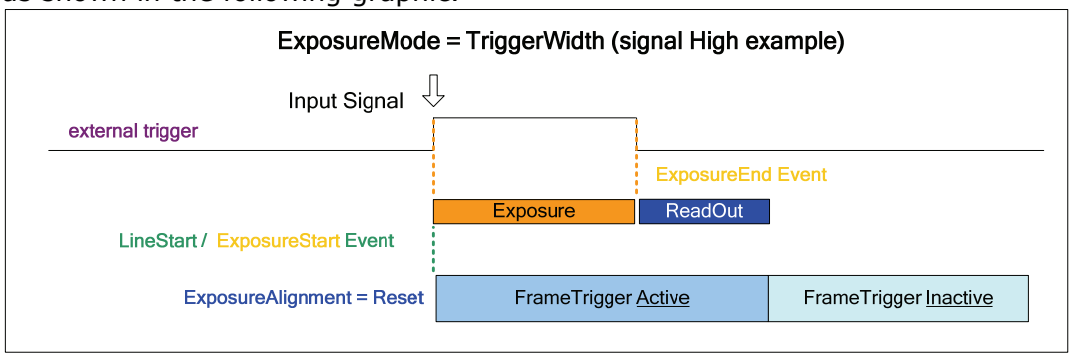
Features and limitations are described below.

- **Black Level** offset is expressed as a digital number providing a +/- offset from the factory setting. The factory setting optimized the black level offset for maximum dynamic range under controlled ideal dark conditions.
- **Analog Gain** is expressed as a multiplication factor applied at the sensor level, before any FFC. The increased gain increases the sensor dynamic range but with a non-proportional increase in noise.
- For each setting of analog gain, the sensor data has applied a unique Factory set Flat Field Correction, to ensure uniform pixel response. which is applied after the analog gain stage but before the digital gain stage.
- When any Flat Field Correction is applied, the resulting gain multiplying factor is increased based on the FFC calibration. As an example with Genie TS-12M with FFC Active and default Black Offset, with an analog gain set to 2.65, the resulting multiplying factor is 2.75.
- **Digital Gain** is expressed as a multiplication factor applied after the Analog Gain and any FFC stages, but note that increasing digital gain does not increase the low level resolution and increases the sensor noise proportionately.

Exposure Controls Details

Exposure Control modes define the method and timing of controlling the sensor integration period. The integration period is the amount of time the sensor is exposed to incoming light before the video frame data is transmitted to the controlling computer.

- Exposure control is defined as the start of exposure and exposure duration.
- The feature **Exposure Mode** selects the controlling method for the exposure.
- The start of exposure can be driven by an internal timer signal, an external trigger signal, or a software function call.
- The exposure duration can be programmable (such as the case of an internal timer) or controlled by the external trigger pulse width (when the feature ExposureMode = TriggerWidth) as shown in the following graphic.

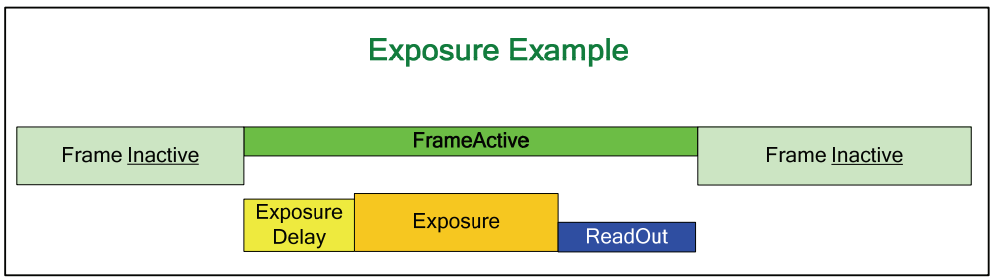


Internal Programmable Exposure

The Genie TS in an Internal Programmable Exposure mode has the following features:

- Programmable internal trigger, where the maximum and minimum sensor frame rate limits are defined by the ExposureTime feature.
- Exposure synchronization timing is "Synchronous Mode" (on page 57) where the exposure is aligned with the sensor horizontal line timing and the next acquisition is triggered by an internal programmable timer.
- Exposure duration is user programmable (exposure maximum is dependent on the frame rate). Minimum exposure (in µs) is model dependent.
- Image readout is simultaneous where the grabbed image frame is readout during the next frame exposure time. This allows for fastest possible frame rates. See the timing diagram below.

Example Timing:

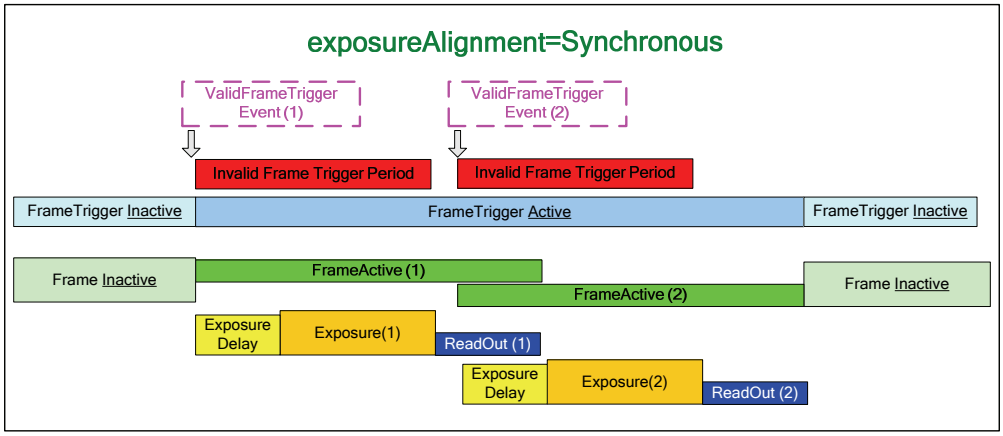


Free-running Exposure Timing

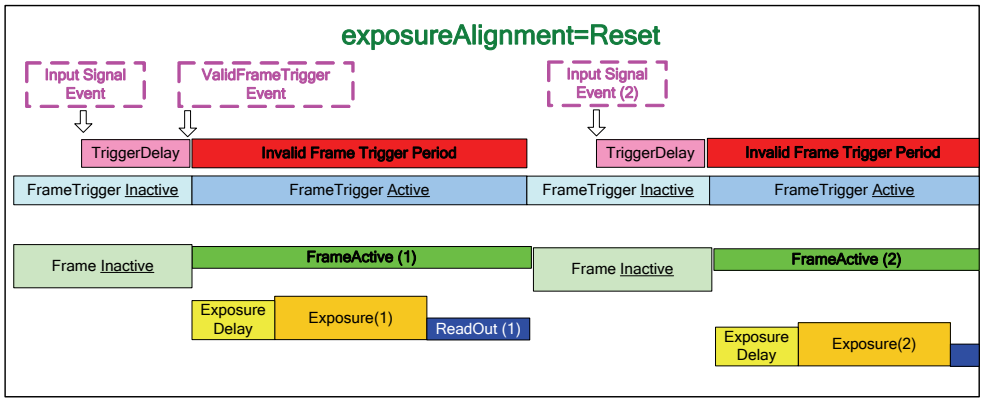
External Trigger Programmable Exposure

- Also known as "Edge Pre-select" exposure. See the timing diagram below.
- An external trigger edge initiates the exposure process.
- The user programmable delay (exposureDelay) from valid trigger edge to start of exposure is camera model specific.
- Supports "Synchronous Mode" (on page 57) timing for fastest possible frame rates. Start of exposure is aligned on the next horizontal line while the exposure duration period is in 1µs steps. Exposure and sensor readout can be concurrent.
- Supports "Reset Mode" (on page 57) timing. Exposure duration is in 1µs steps. Exposure and sensor readout must be sequential, limiting the maximum frame rate.
- Exposure duration is programmable from the model dependent minimum to 16 seconds (in 1µs steps).
- Any external trigger received before the last exposure is ignored.

Example Timing



Programmable Synchronous Mode Exposure Timing



Programmable Reset Mode Exposure Timing

Synchronization Timing

Genie TS supports two types of sensor synchronization used to align the exposure to sensor timing:

- **Synchronous Mode**: Exposure is synchronous to the line timing of the sensor. Exposure time steps are 1µs and the readout can be concurrent to the exposure for the fastest possible frame rate.
- **Reset Mode**: Timing is reset to initiate exposure of the next frame. Exposure time steps are 1µs, but readout must be sequential to exposure, reducing the maximum achievable frame rate.

Synchronous Mode

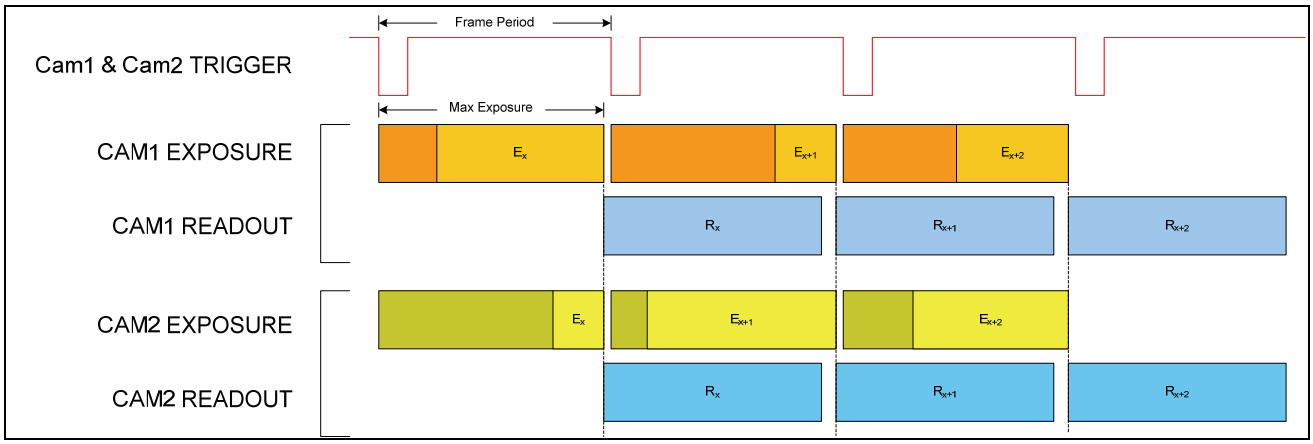
- Synchronous mode starts the exposure period aligned to the sensor horizontal line timing and the programmable duration steps are 1µs.
- Exposure duration is from a camera sensor specific minimum (in µs) up to 16 sec.
- In this mode, sensor exposure and sensor readout of the previous frame's exposure occur simultaneously. This allows operating the sensor up to its maximum frame rate.
- Any trigger received before the start of frame readout is ignored and generates an invalid frame trigger event.
- Since the external trigger is asynchronous with the Genie horizontal line timing, the frame exposure start is subject to 1 horizontal line jitter.

Reset Mode

- Exposure starts immediately after a valid trigger plus the possible exposure delay (see the sensor specific performance specifications).
- Exposure time is user programmable or controlled by the trigger pulse width. Short External Trigger timing must account for input signal propagation delays as specified in the external input technical specifications.
- Minimum exposure is camera sensor specific (in µs) to a maximum of 16 seconds, in steps of 1µs. Exposures are never less then the specified sensor minimum even with a shorter trigger pulse width.
- Sensor readout must complete before the next exposure can start. That is, exposure and readout are sequential. Therefore, the maximum frame rate is lower than for Synchronous mode.
- Any external trigger received before the previous exposure/read out sequence is completed, is ignored.

Exposure Alignment: Synchronous_EOE & Reset_EOE

These two exposure modes are specifically designed for cases where multiple cameras using independent auto-exposure modes are driven by a common exposure trigger and require synchronized frame readouts to the host system.



An Example Setup:

- Configure the two cameras for the required Auto-Brightness / Auto-Exposure mode.
- The trigger signal to the two cameras requires a consistent pulse rate, where the period is just longer than the longest exposure time required.
- Enable Trigger Mode on the two cameras, along with any associated features as required.
- Set exposureAlignment to either *Synchronous_EOE or Reset_EOE to enable end of exposure readout mode.*
- Set *ExposureTimeMaxValue to define the maximum possible exposure required which is within the trigger signal period. Frame readout occurs at the end of this maximum exposure period no matter how short or long the actual exposure was.*

Using Auto-Brightness

The Auto-Brightness features are designed to maintain consistent brightness (or image intensity) in situations where lighting varies. This feature set benefits from being optimized for each application. This section provides information pertaining to making these adjustments and their interdependencies. All feature settings and acquisitions examples below are made using the Sapera CamExpert tool.

Important: Setup is critical. The Auto-Brightness algorithm can not converge unless control features are set properly (as required by the imaging situation). The following cases describe simple setups and the control feature considerations required to make them work.

General Preparation

- Before using any controls, a simple setup for experimentation is to have a reasonable free running acquisition of n-frames per second (*AcquisitionFrameRate*) and an exposure time (*ExposureTime*) that provides a viewable image.
- Take note of the frame rate and exposure time. If the frame rate is very slow due to a long exposure, add analog gain (*GainSelector* and *Gain*) and adjust the exposure time again.

- Enable all Auto-Brightness features by setting *autoBrightnessMode* to active (live acquisition must be off). This master switch feature only activates the auto-brightness, auto-exposure, and auto-gain controls but doesn't enable the processing.
- The features *autoBrightnessSequence*, *autoBrightnessTargetSource*, *autoBrightnessTarget*, *autoBrightnessTargetRangeVariation,* and *autoBrightnessAlgorithm* can remain at their default settings for this demo.
- Note that the *Auto-Brightness* function is not available if M*ulti Slope Sensor Response Mode* or *Cycling Mode* is active.

The Auto-Brightness examples below are summarized as follows:

- Auto-Brightness by Frame Luminance Averaging
- Auto-Brightness by using a Frame Histogram
- Auto-Brightness by Adjusting a Digital Gain
- Auto-Brightness by Adjusting both Gain and Exposure

Auto-Brightness with Frame Luminance Averaging

After the preparations described above, the Auto-Exposure function is tested as follows. These setup steps are made before doing a live acquisition.

- Set the *autoBrightnessAlgoConvergenceTime* to a larger value than the default 2 seconds if more time is required to ensure adequate time for convergence.
- Set *ExposureAuto* to Continuous to activate all Auto-exposure features.
- Referring to the *ExposureTime* value used to get a viewable image during the free-running preparation stage, set *exposureAutoMaxValue* to a maximum exposure time longer than was needed. This maximum exposure limit feature may be required in imaging situations where the frame rate must not be forced below some minimum value. Also check that *exposureAutoMinValue* is low enough to allow the auto exposure a wide range to function in (but not too low else the algorithm will undershoot).
- Enable live acquisition (Grab button in CamExpert). The image exposure will adjust itself until the *autoBrightnessTarget* value is achieved. During live acquisition, the *autoBrightnessTarget* value can be changed to observe the algorithm converge to the new luminance value.
- Stop live acquisition (Freeze button in CamExpert). The feature *ExposureTime* is updated with the last exposure time used by the auto exposure algorithm. Adjust frame rate and analog gain settings as required to test again. Adjust other features mentioned as required.

Auto-Brightness with Histogram Windowing Algorithm

By setting the *autoBrightnessAlgorithm* to *Histogram Windowing* the algorithm adjusts the exposure by calculating the image histogram to shift its center around the *autoBrightnessTarget* value. All other feature controls act in a similar fashion as when frame averaging is selected.

The histogram windowing mode activates two additional control features:

- *autoBrightnessAlgoHistogramWindowingLowerBoundary* which sets a lower luminance boundary as a percentage of the current histogram data range. As an example, setting this to 20 will allow the algorithm to ignore pixel gray levels from 0 to 19% of the histogram data.
- *autoBrightnessAlgoHistogramWindowingUpperBoundary* which sets an upper luminance boundary as a percentage of the current histogram data range. As an example, setting this to 80 will allow the algorithm to ignore pixel gray levels from 81 to 100% of the histogram data.

Auto-Gain

An alternative method of automating exposure control is by varying the Genie TS Digital Gain. The user needs to note that the digital gain stage is limited to a small positive multiplier and will have the side effect of increasing digital noise.

- Setup will be similar to using auto exposure alone.
- Enable automatic digital gain by setting the feature *GainAuto* to Continuous.
- Limit the total digital gain range by adjusting the values for *gainAutoMaxValue* and *gainAutoMinValue*.

Auto-Brightness by using Auto-Exposure and Auto-Gain

- Use both *ExposureAuto* and *GainAuto* together to maximize the range of the Genie TS Auto-Brightness range.
- Use *autoBrightnessSequence* to select the order of automation.
- Caution: Even with both automatic functions enabled, exposure convergence to a target value requires proper setup.

Using Multi-Slope Response Mode

The Genie TS Multi-slope Mode is used to effectively increase the sensor dynamic range in cases where some part of the image would be overexposed (i.e. saturated). Normally an image sensor has a linear relationship between light intensity (number of photons) and the digital gray level number (DN) output. But situations exist where a proper exposure for most of an image will also include areas that are fully saturated (overexposed).

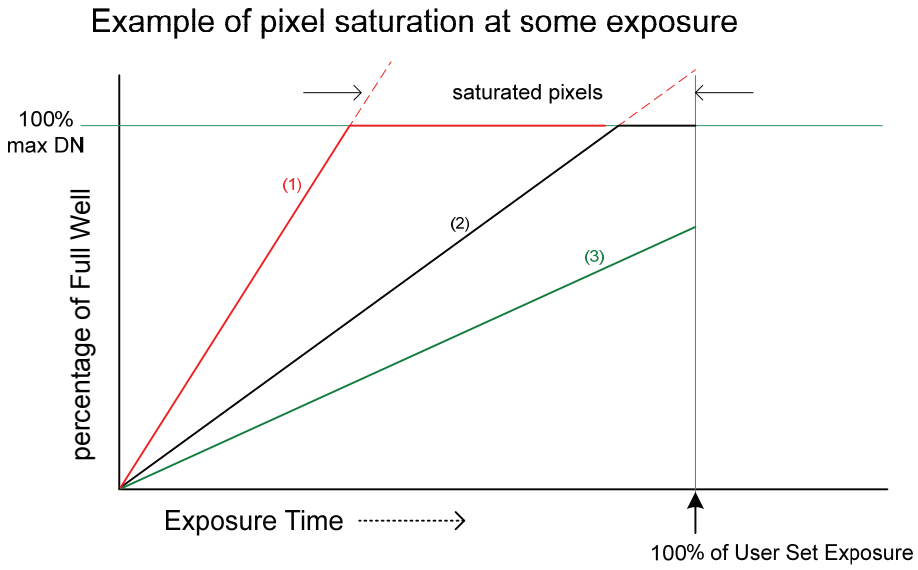
The Multi-Slope mode allows using the camera's linear response over a majority of its dynamic range (user defined range) and then automatically reduces sensitivity for a period of exposure time – essentially delaying the sensor saturation point. A critical point to understand is that during the period of reduce photon accumulation, the sensor response is nonlinear.

The Genie TS Multi-Slope Mode when enabled, uses one break point (i.e. response knee — *multiSlopeKneePositionY*) with the user defining the position of the response knee and a second parameter to vary the exposure time of reduced sensor response (*multiSlopeKneePositionX*).

The following graphics describe a problem exposure that has saturated pixels and a method to extend the effective dynamic range using the Genie TS Multi-slope Mode.

Example of an Exposure with Pixel Saturation

This graphic illustrates how an exposure time selected to achieve maximum dynamic range without clipping into black, may have some pixels saturated into white due to lighting conditions. Reducing the exposure time will eliminate the saturation but low DN image details will be lost in black.



- Curve (1): Represents a pixel that is overexposed quickly, long before the end of the exposure time. The user decides to ignore these areas of the image.
- Curve (2): Represents a pixel that becomes overexposed shortly before the end of the exposure time. Pixels such as this represent candidates for the multi-slope feature.
- Curve (3): Represents a pixel that is not overexposed for the set exposure time.
- Simply reducing the exposure time, such that pixels similar to curve (2) are not saturated, would reduce the gray level of pixels such as curve (3). This solution often is not acceptable.
- The Multi-Slope feature can effectively extend the dynamic range for pixel exposures such as curve (2), while maintaining the full linear exposure for pixels such as curve (3), as explained in the following section.
- Note that some pixels, as represented by curve (1), might still saturate. The multi-slope feature controls might only provide a compromised solution dependent on the imaging setup.

The following image shows overexposure of the bright sky but proper exposure in the medium to darker gray areas. This is a classic example of a camera's limited dynamic range.

Example of Multi-Slope Operation

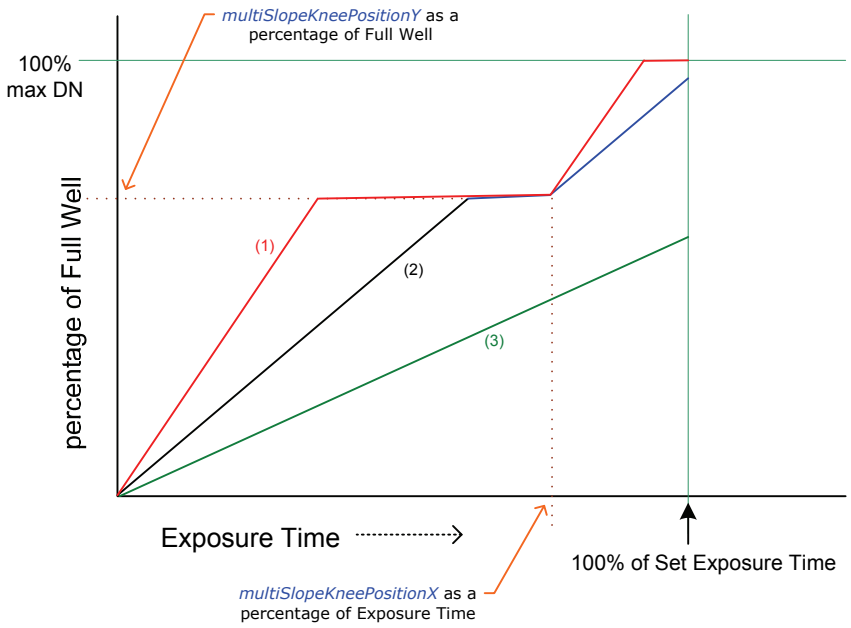
With multi-slope mode enabled, for a given user set exposure time, the user chooses the points of exposure where the sensor response reduces and becomes nonlinear(*multiSlopeKneePositionY*), plus the point where the sensor response returns to normal (*multiSlopeKneePositionX*). This effectively acts to extend the dynamic range.

Important considerations are:

- This graphic serves only as an illustration to possible Multi-Slope Mode solutions for imaging problems. Any solution will have tradeoffs.
- The two variables will interact requiring the user to make multiple changes to converge to a solution.
- Only pixels with DN values exceeding the setting for *multiSlopeKneePositionY* (within the user set exposure time) will be affected by the multi-slope function. All others maintain their linear response typical with a standard exposure.
- The nonlinear reduced response zone will affect the perceived image quality. The user needs to locate this zone where gray level linearity is not critical for the imaging solution.
- The actual sensor response through the nonlinear zone into the final linear ramp cannot be represented truthfully as two hard break points. Transitions are more gradual, therefore the nonlinear zone spans a larger number of image DN. Typically, the sensor will be up to 4 DN higher through the nonlinear zone than calculated using the *multiSlopeKneePositionY* setting.

- Changes in lighting will require changes to multi-slope parameters to maintain maximum optimal sensor dynamic range, for a given exposure time.

Example use of Multi-Slope Mode



- Curve (1): Represents an overexposed pixel that the user chooses to ignores. The multi-slope feature acts to reduce its sensitivity until the *multiSlopeKneePositionX* setting, but these pixels will still saturate.
- Curve (2): Represent pixels that the user requires the multi-slope feature to act on. At the *multiSlopeKneePositionY* setting, the sensitivity is reduced until the *multiSlopeKneePositionX* setting where sensitivity returns to normal. With proper setup the full image dynamic range is captured for the selected gray levels, but with an accepted nonlinear range.
- Curve (3): Represents a pixel that is not overexposed for the set exposure time. Therefore these dark pixels do not cross the *multiSlopeKneePositionY* setting, and their sensitivity remains linear.

The following image shows how the Multi-Slope feature is used to extend the dynamic range of the sky area which was overexposed in the previous image. For the record, this sample image was taken with an Exposure Time=800µs, *multiSlopeKneePositionY*=30%, and *multiSlopeKneePositionX*=50%, but each imaging setup will be different.

Key points concerning Multi-Slope Mode:

- Auto-Brightness mode must be disabled.
- Exposure synchronization is automatically set to Reset Mode (lowers limit for maximum fps). The exposure is not automatically returned to synchronous mode when Multi-Slope Mode is disabled.
- Sensor characteristics change above the knee point. Increasing the dynamic range above the *multiSlopeKneePositionY* setting implies a nonlinear sensor response.
- Overall Analog Gain is reduced to 67% (models TS-M4096, TS-M3500, TS-M2500) of the default gain when enabled, therefore increasing the pixel well capacity at the sensor level.
- When used with a color camera, white balance will not be correct above the knee point.

Example Procedure for Multi-Slope Setup

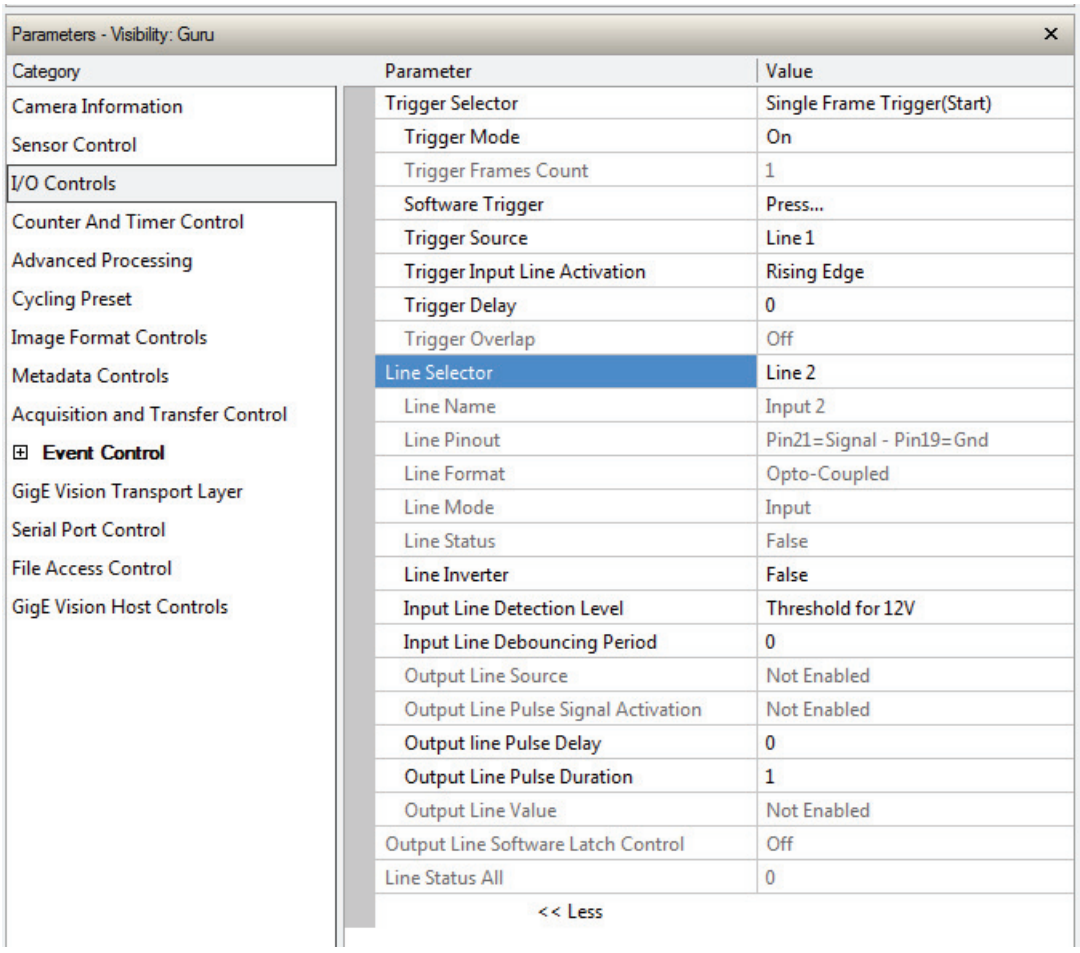
- Note: This example serves only as a guide to using the Multi-Slope feature. Every imaging setup is a compromise between finite dynamic range, sensor signal-to-noise, and variable lighting situations.
- First adjust exposure time (and lens iris) such that all dark areas of the image are properly exposed. Bright areas will be saturated in situations where the multi-slope function is required.
- Enable Multi-Slope Mode (*multiSlopeSensorResponseMode*). With the default values for *multiSlopeKneePositionY* and *multiSlopeKneePositionX,* there will not be any obvious change at this point.

- Reduce the value for the exposure knee position *multiSlopeKneePositionY* (start by decreasing by values of 10). As the exposure knee point is dropped, the saturated image areas will start to have detail as the effective sensitivity of the bright areas is reduced.
- Reduce the value for *multiSlopeKneePositionX,* while grabbing frames to observe the quality of the image, keeping in mind the effective change as described in the preceding graphics.
- Note also that *multiSlopeKneePositionY and multiSlopeKneePositionX* will interact and therefore change the effective results for a given imaging situation. With variable lighting such as a camera outdoors, the two multi-slope variables and the camera iris will need dynamic adjustments to maintain image quality.

I/O Control Category

The Genie TS I/O controls, as shown by CamExpert, groups features used to configure external inputs and acquisition actions based on those inputs, plus camera output signals to other devices. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



I/O Control Feature Descriptions

The following table describes these features along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

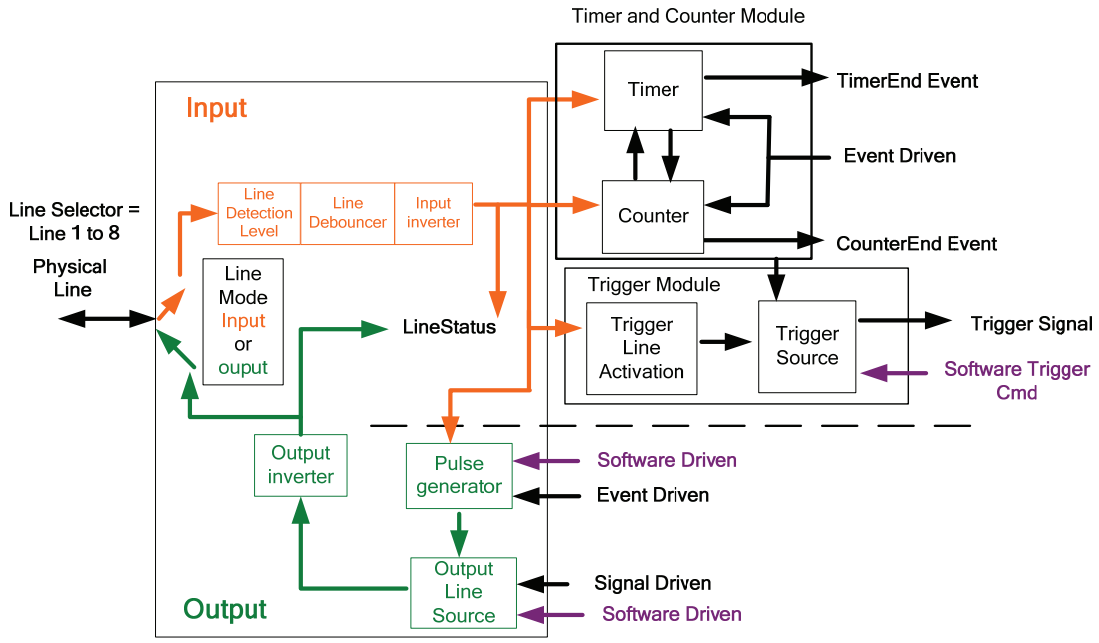
Display Name	Feature & Values	Description	Device Version & View
Trigger Selector	TriggerSelector	Selects which type of trigger to configure with the various Trigger features.	1.00 Beginner
Single Frame Trigger(Start)	*FrameStart*	*Selects a trigger starting the capture of a single frame.*	
MultiFrame Trigger(Start)	*FrameBurstStart*	*Selects a trigger to capture multiple frames. The number of frames is specified by the triggerFrameCount feature.*	
Trigger Mode	TriggerMode	Controls the enable state of the selected trigger.	1.00 Beginner
Off	*Off*	*The selected trigger is turned off.*	
On	*On*	*The selected trigger is turned active.*	
Trigger Frames Count	triggerFrameCount	Sets the total number of frames to acquire when a valid trigger is received. This feature is R/W only whenTriggerSelector = FrameBurstStart. The trigger frame count includes the number of frames specified in the Pre-Trigger Frame Count feature.	1.00 DFNC Beginner
Software Trigger	TriggerSoftware	Generate a software command internal trigger immediately no matter what the TriggerSource feature is set to.	1.00 Beginner
Trigger Source	TriggerSource	Specifies the internal signal or physical input line to use as the trigger source. The selected trigger must have its TriggerMode set to ON. See Input Signals Electrical Specifications.	1.00 Beginner
Line 1	*Line1*	*Select Line 1 (and associated I/O control block) to use as the external trigger source. See LineSelector feature for complete list.*	
Line 2	*Line2*	*External Trigger on Line 2.*	
Line 3	*Line3*	*External Trigger on Line 3.*	
Line 4	*Line4*	*External Trigger on Line 4.*	
Software	*Software*	*The trigger command source is only generated by software using the Trigger Software command.*	
Timer1End Event	*Timer1End*	*Select the TimerEnd Event as the internal trigger source.*	
Counter1End Event	*Counter1End*	*Select the CounterEnd Event as the internal trigger source.*	
Trigger Input Line Activation	TriggerActivation	Select the activation mode for the selected Input Line trigger source. This is applicable only for external line input lines.	1.00 Beginner
Rising Edge	*RisingEdge*	*The trigger is considered valid on the rising edge of the line source signal (after any processing by the line inverter module).*	
Falling Edge	*FallingEdge*	*The trigger is considered valid on the falling edge …*	
Any Edge	*AnyEdge*	*The trigger is considered valid on any edge …*	

Level High	*LevelHigh*	*The trigger is considered valid on the high level …*	
Level Low	*LevelLow*	*The trigger is considered valid on the low level …*	
Trigger Delay	TriggerDelay	Specifies the delay in microseconds to apply after receiving the trigger and before activating the triggerEvent. (min=0, max=2000000)	1.00 Beginner
Trigger Overlap	TriggerOverlap	States if a trigger overlap is permitted with the Active Frame readout signal. This read only feature defines if a new valid trigger will be accepted (or latched) for a new frame. (RO)	1.00 Beginner
Off	*Off*	*No trigger overlap is permitted.*	
ReadOut	*ReadOut*	*Trigger is accepted immediately after the exposure period.*	
Line Selector	LineSelector	Selects the physical line (or pin) of the external device connector to configure.	1.00 Beginner
Line 1 *Line 2* *Line 3* *Line 4* *Line 5* *Line 6* *Line 7* *Line 8*	*Line1* *Line2* *Line3* *Line4* *Line5* *Line6* *Line7* *Line8*	*Index of the physical line and associated I/O control block to use.*	
Line Name	lineName	Description of the physical pin associated with the logical line.	1.00 Beginner DFNC
Input 1 *Input 2* *Input 3* *Input 4*	*Input1* *Input2* *Input3* *Input4*	*Associated with the logical line Input 1* *Associated with the logical line Input 2* *Associated with the logical line Input 3* *Associated with the logical line Input 4*	
Output 1 *Output 2* *Output 3* *Output 4*	*Output1* *Output2* *Output3* *Output4*	*Associated with the logical line Output 1* *Associated with the logical line Output 2* *Associated with the logical line Output 3* *Associated with the logical line Output 4*	
Line Pinout	linePinAssociation	Enumeration of the physical line (or pin) on the device Micro-D 25 pin connector. (RO)	1.00 Beginner
Pin20=Signal - Pin19=Gnd	*Pin20Signal_Pin19Gnd*	*Pin 20 is the Input 1 Signal and Pin 19 is the common input Ground on the device Micro-D 25 connector.*	
Pin21=Signal - Pin19=Gnd	*Pin21Signal_Pin19Gnd*	*Pin 21 Input - Pin 19 Ground …(input 2)*	
Pin22=Signal - Pin19=Gnd	*Pin22Signal_Pin19Gnd*	*Pin 22 Input - Pin 19 Ground …(input 3)*	
Pin23=Signal - Pin19=Gnd	*Pin23Signal_Pin19Gnd*	*Pin 23 Input - Pin 19 Ground …(input 4)*	
Pin15=Signal - Pin14=Gnd	*Pin15Signal_Pin14Gnd*	*Pin 15 is the Output 1 Signal and Pin 14 is the common output Ground on the device Micro-D 25 connector.*	
Pin16=Signal - Pin14=Gnd	*Pin16Signal_Pin14Gnd*	*Pin 16 Output - Pin 14 Ground …(output 2)*	
Pin17=Signal - Pin14=Gnd	*Pin17Signal_Pin14Gnd*	*Pin 17 Output - Pin 14 Ground …(output 3)*	
Pin18=Signal - Pin14=Gnd	*Pin18Signal_Pin14Gnd*	*Pin 18 Output - Pin 14 Ground …(output 4)*	
Line Format	LineFormat	Specify the current electrical format of the selected physical input or output. (RO)	1.00 Expert
Opto-Coupled	*OptoCoupled*	*The line is opto-Coupled.*	
Line Mode	LineMode	Reports if the physical Line is an Input or Output signal. (RO) See Input Signals Electrical Specifications. See Output Signals Electrical Specifications.	1.00 Expert
Input	*Input*	*The line is an input line.*	
Output	*Output*	*The line is an output line.*	
Line Status	LineStatus *False / True*	Returns the current status of the selected input or output line. (RO)	1.00 Expert

Line Status All	LineStatusAll	Returns the current status of all available line signals, at time of polling, in a single bitfield. The order is Line1, Line2, Line3, ... (RO)	1.00 Expert
Line Inverter	LineInverter	Controls whether to invert the polarity of the selected input or output line signal.	1.00 Beginner
	False / True		
Input Line Detection Level	lineDetectionLevel	Specifies the voltage threshold required to recognize a signal transition on an input line.	1.00 Beginner DFNC
Threshold for TTL	*Threshold_for_TTL*	*A signal below 0.8V will be detected as a Logical LOW and a signal greater then 2.4V will be detected as a Logical HIGH on the selected input line.*	
Threshold for 12V	*Threshold_for_12V*	*A signal below 2.0V will be detected as a Logical LOW and a signal greater then 10V will be detected as a Logical HIGH on the selected input line.*	
Threshold for 24V	*Threshold_for_24V*	*A signal below 4.0V will be detected as a Logical LOW and a signal greater then 20V will be detected as a Logical HIGH on the selected input line.*	
Input Line Debouncing Period	lineDebouncingPeriod	Specifies the minimum delay before an input line voltage transition is recognizing as a signal transition.	1.00 Beginner DFNC
Output Line Source	outputLineSource	Selects which internal signal or event driven pulse or software control state to output on the selected line. Note, the LineMode feature must be set to Output. The List of supported output line sources is product-specific. The Event Control section provides details and timing diagrams for the supported trigger modes.	1.00 Beginner DFNC
Off	*Off*	*Line output is Open*	
Software Controlled	*SoftwareControlled*	*The OutputLineValue feature changes the state of the output*	
Pulse on: Start of Frame	*PulseOnStartofFrame*	*Generate a pulse on the start of the Frame Active event*	
Pulse on: Start of Exposure	*PulseOnStartofExposure*	*Generate a pulse on the ExposureStart event. This option is typically used to trigger a strobe light.*	
Pulse on: End of Exposure	*PulseOnEndofExposure*	*Generate a pulse on the ExposureEnd event. This option is typically used to trigger a strobe light.*	
Pulse on: Start of Readout	*PulseOnStartofReadout*	*Generate a pulse on the ReadoutStart event.*	
Pulse on: End of Readout	*PulseOnEndofReadout*	*Generate a pulse on the ReadoutEnd event.*	
Pulse on: Valid Frame Trigger	*PulseOnValidFrameTrigger*	*Generate a pulse on the ValidFrameTrigger event.*	
Pulse on: Invalid Frame Trigger	*PulseOnInvalidFrameTrigger*	*Generate a pulse on the InvalidFrameTrigger event.*	
Pulse on: Start of Acquisition	*PulseOnStartofAcquisition*	*Generate a pulse when the AcquisiontStart event occurs*	
Pulse on: End of Acquisition	*PulseOnEndofAcquisition*	*Generate a pulse when the AcquisiontStop event occurs*	
Pulse on: End of Timer 1	*PulseOnEndofTimer1*	*Generate a pulse on the TimerEnd 1 event.*	
Pulse on: End of Counter 1	*PulseOnEndofCounter1*	*Generate a pulse on the CounterEnd 1 event.*	
Pulse on: Input 1 Event	*PulseOnInput1*	*Generate a pulse on the Input signal 1 event*	
Pulse on: Input 2 Event	*PulseOnInput2*	*Generate a pulse on the Input signal 2 event*	
Pulse on: Input 3 Event	*PulseOnInput3*	*Generate a pulse on the Input signal 3 event*	
Pulse on: Input 4 Event	*PulseOnInput4*	*Generate a pulse on the Input signal 4 event*	
Pulse on: Software Command	*PulseOnSoftwareCmd*	*Generate a pulse on the Input of a Software Command*	
Output Line Pulse Signal Activation	outputLinePulseActivation	Specifies the input line activation mode to trigger the OutputLine pulse.	1.00 Beginner DFNC
Rising Edge	*RisingEdge*	*Specifies that the trigger is considered valid on the rising edge of the source signal.*	

Falling Edge	*FallingEdge*	*Specifies that the trigger is considered valid on the falling edge of the source signal.*	
Any Edge	*AnyEdge*	*Specifies that the trigger is considered valid on the falling or rising edge of the source signal.*	
Output Line Pulse Delay	outputLinePulseDelay	Sets the delay (in µs) before the output line pulse signal. Applicable for the OutputLineSource feature. Note, the LineMode feature must be set to output.	1.00 Beginner DFNC
Line Pulse Duration	outputLinePulseDuration	Sets the width (duration) of the output line pulse in microseconds. The LineMode feature must be set to Output.	1.00 Beginner DFNC
Output Line Software Latch Control	outputLineSoftwareLatchControl	When Off, the selected output line is set with the value in Output Line Value. (RO)	1.00 Guru DFNC
Off	*Off*	*Output pin state set by outputLineValue.*	
Latch	*Latch*	*Output pin state set by outputLineSoftwareCmd.*	
Output Line Software Command	outputLineSoftwareCmd	Writing a value of 1 in the bit field applies the Latch value of the outputLineSoftwareLatchControl and/or executes the PulseOnSoftwareCmd for any output line programmed for software control. The feature outputLineSoftwareCmd can take any binary value and each bit set to 1 corresponds to a Icommand for an Output. Note that Outputs are numbered from 1 to N, therefore Bit 1 of outputLineSoftwareCmd corresponds to Output1. This is applicable to OutputLineSource = Pulse On: where Software Cmd (for Pulse mode) or OutputLineSource = SoftwareControlled and OutputLineSoftwareLatchControl = Latch (for static states).	1.20 Expert DFNC
Output Line Value	outputLineValue	Sets the output state of the selected Line if the outputLineSoftwareLatchControl = OFF. OutputLineSource must be SoftwareControlled. If the outputLineSoftwareLatchControl = Latch , the state of the pin will change with the outputLineSoftwareCmd command.	1.00 Beginner DFNC
Active	*Active*	*Sets the Output circuit to close*	
Inactive	*Inactive*	*Sets the Output circuit to open*	

I/O Module Block Diagram



Trigger Mode Details

Genie TS image exposures are initiated by an event. The trigger event is either the camera's programmable internal clock used in free running mode, an external input used for synchronizing exposures to external triggers, or a programmed function call message by the controlling computer. These triggering modes are described below.

- **Free running (Trigger Mode=Off)**: The Genie free-running mode has programmable internal timers for frame rate and exposure period. Frame rate minimums, maximums, and increments supported are sensor specific. Maximum frame rates are dependent on the required exposure. This always uses Synchronous mode where exposure is aligned to the sensor horizontal line timing.
- **External trigger (Trigger Mode=On)**: Exposures are controlled by an external trigger signal where the specific input line is selected by the **Trigger Source** feature. External signals are isolated by an opto-coupler input with a time programmable debounce circuit.

Trigger Source Types

- **Trigger Source=Software**: An exposure trigger is sent as a control command via the Ethernet network connection. Software triggers can not be considered time accurate due to network latency and sequential command jitter. But a software trigger is more responsive than calling a single-frame acquisition since the latter must validate the acquisition parameters and modify on-board buffer allocation if the buffer size has changed since the last acquisition.
- **Trigger Source=Timer1End Event:** The Timer1 End Event is used as the internal trigger source. Refer to Counter and Timer Controls for information on those features.
- **Trigger Source=Counter1End Event**: The Counter1 End Event is used as the internal trigger source.
- **Trigger Line Polarity:** For line signals, a rising edge signal is suggested to minimize the time it takes for the opto-coupler to change state.

Input Line Details

The general purpose input line signals are connected to I/O lines 1 through 4 and have the following features for control or status indication.

- **Feature set:** LineSelector (RW), LineName (RO), linePinAssociation (RO), LineFormat (RO), LineMode (RO), lineDetectionLevel (RW), lineDebouncingPeriod (RW), LineInverter (RW), LineStatus (RO).
- **Connector:** See 25-pin Micro-D type Connector Details for connector pinout and electrical information. The cable shell and shield should electrically connect the Genie TS chassis to computer chassis for maximum EMI protection.
- **Line Transition Validation:** Each input incorporates a signal debounce circuit (following the opto-couple) to eliminate short noise transitions that could be wrongly interpreted as a valid pulse. The duration is user-programmable from 0µs to 255µs with CamExpert.
- **Line Signal Propagation & Timing:** The input propagation delay is dependent on the signal voltage used to activate the opto-coupled input. Maximum delay values are defined in Input Signals Electrical Specifications.

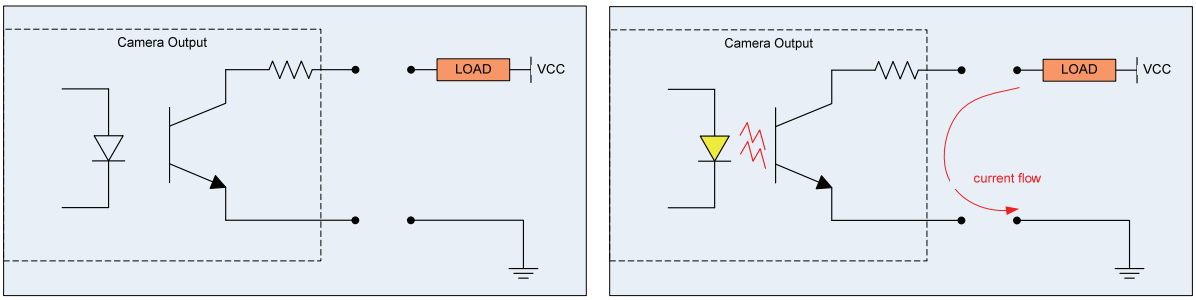
Output Line Details

The general purpose output line signals are connected to I/O lines 5 through 8 and have the following features for control or status indication.

- **Feature set:** LineInverter (RW), outputLineSource (RW), outputLinePulseDelay (RW), outputLinePulseDuration (RW), outputLineValue (RW), outputLineSoftwareCmd (RW), LineSelector (RW), LineName (RO), linePinAssociation (RO), LineFormat (RO), LineMode (RO), LineStatus (RO). See Output Signals Electrical Specifications for more information.
- **External outputs:** Can be used as a strobe signals to control lighting or to generate programmable pulses when specific events are generated by the camera. They can also be set to a static state (close or open) by the application.
- **Output on Events:** Each output can be set independently to one of the available event modes defined by the 'outputLineSource' feature.
- For most event modes, the trigger output signal can be set to either Active Open (that is high with the load connected to a voltage source) or Active Closed (where current is drawn through the load). The output delay can be set from 0 to 16 seconds, in increments of 1 µs. The pulse duration can be set from 0 to 16 seconds, in increments of 1 µs.

Output Open and Output Close Modes

Output signal lines can be set to the open or close output state using software rather than hardware events. The following figures show example external circuits.

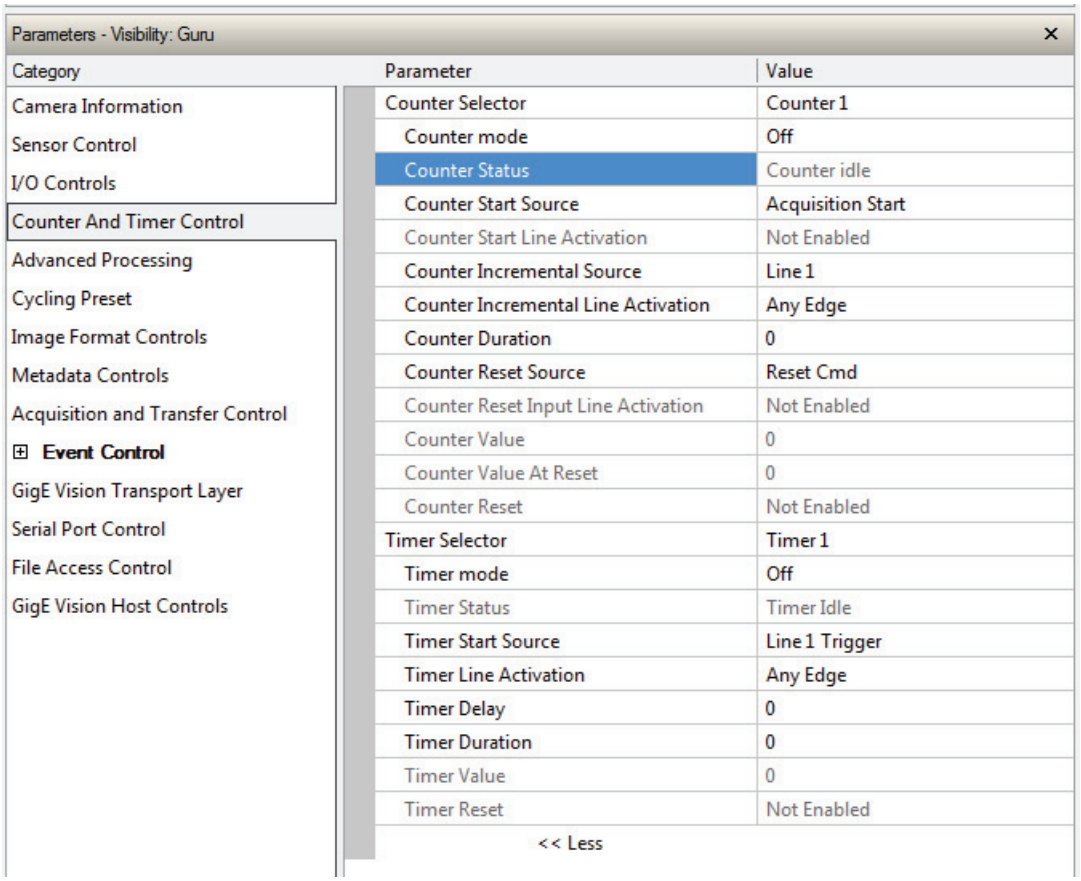


Examples of OPEN and CLOSED output circuits

Counter and Timer Control Category

The Genie TS counter and timer controls, as shown by CamExpert, groups parameters used to configure acquisition counters and timers for various input lines and signal edge detection. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Counter and Timer Control Feature Description

The following table and block diagram, describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

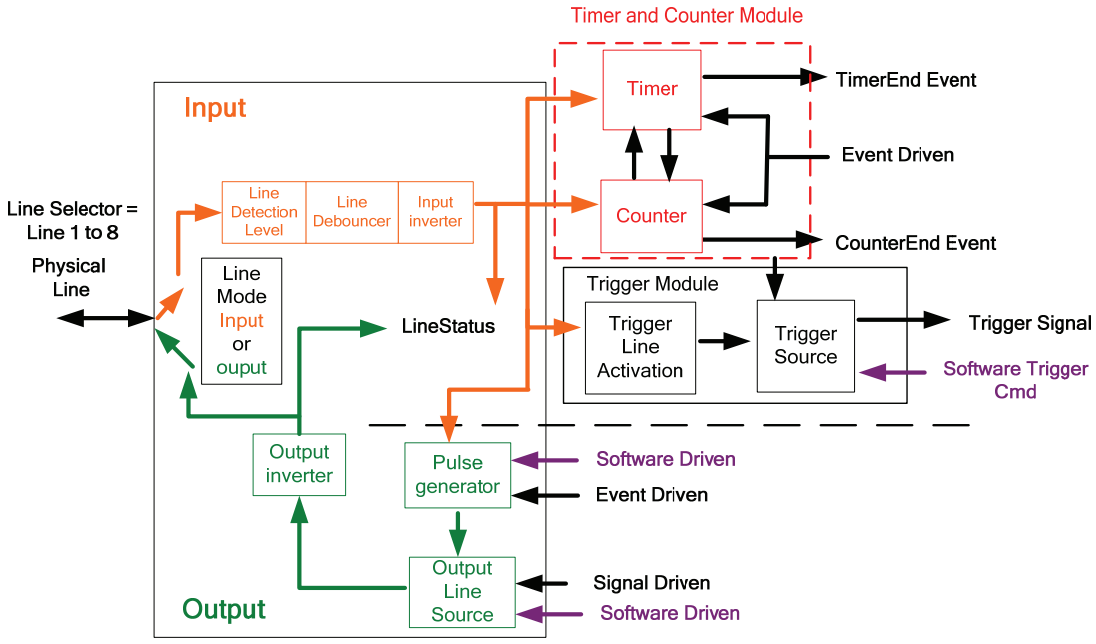
Display Name	Feature & Values	Description	Device Version & View
Counter Selector	counterSelector	Selects the counter to configure.	1.00 Expert DFNC
Counter 1	*Counter1*	*Select counter 1*	
Counter mode	counterMode	Selects the counter mode. The selected Counter is either Active or Disabled. When Disabled, the Counter can be configured.	1.00 Expert DFNC
Off	*Off*	*The selected Counter is Disabled*	
Active	*Active*	*The selected Counter is Enabled*	
Counter Status	counterStatus	Returns the current state of the counter. (RO)	1.00 Expert DFNC
Counter Idle	*CounterIdle*	*The counter is idle.* *The CounterStartSource feature is set to off.*	
Counter Trigger Wait	*CounterTriggerWait*	*The counter is waiting for a start trigger.*	
Counter Active	*CounterActive*	*The counter is counting for the specified duration.*	
Counter Completed	*CounterCompleted*	*The counter reached the CounterDuration count.*	
Counter Overflow	*CounterOverflow*	*The counter reached its maximum possible count.*	
Counter Start Source	counterStartSource	Select the counter start source. Counter increments from 0 to the value of the counterDuration feature of the counterValue Register. If the countStartSource = countResetSource, the counter resets then starts again.	1.10 Expert DFNC
CounterReset Cmd	*Off*	*Counter Starts on the reception of the Counter Reset Icommand.*	
Acquisition Start Cmd	*AcquisitionStart*	*Counter starts on the reception of the Acquisition Start event.*	
Acquisition End	*AcquisitionEnd*	*Counter starts on the reception of the Acquisition End event.*	
Exposure Start	*ExposureStart*	*Counter starts on the reception of the Exposure Start event*	
Exposure End	*ExposureEnd*	*Counter starts on the reception of the Exposure End event.*	
Readout Start	*ReadoutStart*	*Start the counter on the reception of the Readout Start event.*	
Readout End	*ReadoutEnd*	*Start the counter on the reception of the Readout End event.*	
Frame Start	*FrameStart*	*Counter starts on the reception of the Frame Start event.*	
Valid Frame Trigger	*ValidFrameTrigger*	*Counter starts on the reception of the Valid Frame Trigger.*	
Rejected Frame Trigger	*InvalidFrameTrigger*	*Counter starts on the reception of the Invalid Frame Trigger.*	
Line 1	*Line1*	*Counter starts on the specified transitions on Line 1* See Input Signals Electrical Specifications.	
Line 2	*Line2*	*Counter starts on the specified transitions on Line 2*	
Line 3	*Line3*	*Counter starts on the specified transitions on Line 3*	
Line 4	*Line4*	*Counter starts on the specified transitions on Line 4*	
Timer 1 End	*Timer1End*	*Counter starts on the reception of the Timer End event.*	
Counter 1 End	*Counter1End*	*Counter starts on the reception of the Counter End event.*	
Counter Start Line Activation	counterStartLineActivation	Selects the activation mode of the input line trigger which starts the counter. This is only applicable when the counterStartSource feature selects a physical Line.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Starts counting on rising edge of the selected Line.*	
Falling Edge	*FallingEdge*	*Starts counting on falling edge of the selected Line.*	

Any Edge	*AnyEdge*	*Starts counting on the falling or rising edge of the selected Line.*	
Counter Incremental Source	counterIncrementalSource	Select the event source which increments the counter. The Event Control section provides details and timing diagrams for the supported events.	1.00 Expert DFNC
Off	*Off*	*Counter is stopped.*	
Acquisition Start	*AcquisitionStart*	*Counts the number of Acquisition Start events.*	
Acquisition End	*AcquisitionEnd*	*Counts the number of Acquisition End events.*	
Exposure Start	*ExposureStart*	*Counts the number of Exposure Start events.*	
Exposure End	*ExposureEnd*	*Counts the number of Exposure End events.*	
Readout Start	*ReadoutStart*	*Counts the number of Readout Start events.*	
Readout End	*ReadoutEnd*	*Counts the number of Readout End events.*	
Frame Start	*FrameStart*	*Counts the number of Frame Start events.*	
Valid Frame Trigger	*ValidFrameTrigger*	*Counts the number of Valid Frame Triggers.*	
Rejected Frame(s) Trigger	*InvalidFrameTrigger*	*Counts the number of Rejected Frame(s) Trigger.*	
MultiFrame End Trigger	*FrameBurstEnd*	*Counts the number of multiframe end triggers.*	
Line 1	*Line1*	*Counts the number of transitions on Line 1 (based on the counterIncrementalLineActivation feature setting)* See Input Signals Electrical Specifications.	
Line 2	*Line2*	*Counts the number of transitions on Line 2 (based on the counterIncrementalLineActivation feature setting)*	
Line 3	*Line3*	*Counts the number of transitions on Line 3 (based on the counterIncrementalLineActivation feature setting)*	
Line 4	*Line4*	*Counts the number of transitions on Line 4 (based on the counterIncrementalLineActivation feature setting)*	
Internal Clock	*InternalClock*	*The counter increments on each microsecond tick of the device internal Clock.*	
Timer 1 End	*Timer1End*	*Counts the number of TimerEnd events.*	
Counter Incremental Line Activation	counterIncrementalLineActivation	Selects the counter signal activation mode. The counter increments on the specified signal edge or level.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Increment the counter on the rising edge of the selected I/O Line.*	
Falling Edge	*FallingEdge*	*Increment the counter on the falling edge of the selected I/O Line.*	
Any Edge	*AnyEdge*	*Increment the counter on the falling or rising edge of the selected I/O Line.*	
Counter Duration	counterDuration	Sets the duration (or number of events) before the CounterEnd event is generated.	1.00 Expert DFNC
Counter Reset Source	counterResetSource	Selects the signal source to reset the counterValue Register. The counter then waits for the next countStartSource signal or event (unless countResetSource = countStartSource, which starts immediately after reset).	1.10 Expert DFNC
Reset Cmd	*Off*	*Reset on reception of the Reset Icommand.*	
Acquisition Start	*AcquisitionStart*	*Reset on reception of the Acquisition Start.*	
Acquisition End	*AcquisitionEnd*	*Reset on reception of the Acquisition End.*	
Exposure Start	*ExposureStart*	*Reset on reception of the Exposure Start event.*	
Exposure End	*ExposureEnd*	*Reset on reception of the Exposure End event.*	
Readout Start	*ReadoutStart*	*Reset the counter on the reception of the Readout Start event.*	
Readout End	*ReadoutEnd*	*Reset the counter on the reception of the Readout End event.*	
Frame Trigger	*FrameStart*	*Reset on reception of the Frame Trigger.*	
Valid Frame Trigger	*ValidFrameTrigger*	*Reset on reception of the Valid Frame Trigger.*	
Rejected Frame Trigger	*InvalidFrameTrigger*	*Reset on reception of the Invalid Frame Trigger.*	

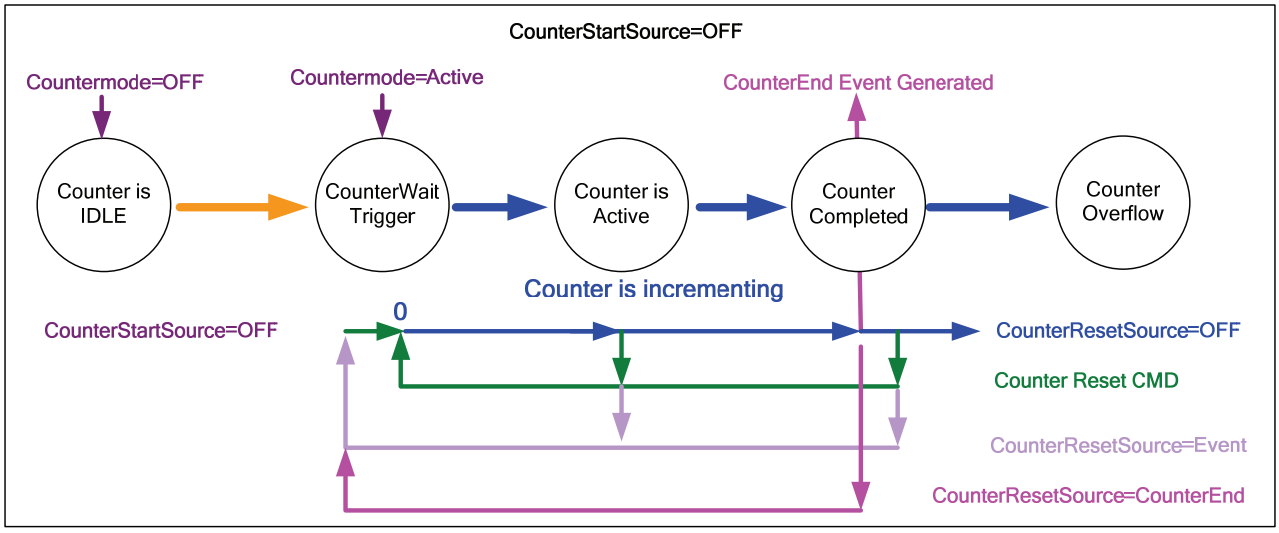
MultiFrame End Trigger	*FrameBurstEnd*	*Reset on reception of the Frame Burst end.*	
Line 1	*Line1*	*Reset counter on the specified transition on line 1.* See Input Signals Electrical Specifications.	
Line 2	*Line2*	*Reset counter on the specified transition on line 2.*	
Line 3	*Line3*	*Reset counter on the specified transition on line 3.*	
Line 4	*Line4*	*Reset counter on the specified transition on line 4.*	
Timer 1 End	*Timer1End*	*Reset on reception of the Timer End.*	
Counter 1 End	*Counter1End*	*Reset on the reception of the Counter end.*	
Counter Reset Input Line Activation	counterResetLineActivation	Specify the edge transition on the selected line that will reset the selected counter.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Reset counter on rising edge of the selected signal.*	
Falling Edge	*FallingEdge*	*Reset counter on falling edge of the selected signal.*	
Any Edge	*AnyEdge*	*Reset counter on the falling or rising edge of the selected signal*	
Counter Value	counterValue	Read the current value of the selected counter. (RO)	1.00 Expert DFNC
Counter Value At Reset	counterValueAtReset	Reads the value of the selected counter when it was reset by a trigger or by an explicit Counter Reset command. (RO)	1.00 Expert DFNC
Counter Reset	counterReset	Resets the selected counter to zero. The counter starts immediately after the reset. To temporarily disable the counter, set the Counter Event Source feature to Off. (WO)	1.00 Expert DFNC
Timer Selector	timerSelector	Selects which timer to configure.	1.00 Expert DFNC
Timer 1	*Timer1*	*Timer 1 selected*	
Timer Mode	timerMode	Select the timer mode. The selected Timer is Active or Disabled. When Disabled, the Timer can be configured.	1.00 Expert DFNC
Off	*Off*	*The selected Timer is Disabled.*	
Active	*Active*	*The selected Timer is Enabled.*	
Timer Status	timerStatus	Returns the current state of the timer. (RO)	1.00 Expert DFNC
Timer Idle	*TimerIdle*	*The timer is idle. The CounterStartSource feature is set to off.*	
Timer Trigger Wait	*TimerTriggerWait*	*The timer is waiting for a start trigger.*	
Timer Active	*TimerActive*	*The timer is counting for the specified duration.*	
Timer Completed	*TimerCompleted*	*The timer reached the TimerDuration count.*	
Timer Start Source	timerStartSource	Select the trigger source to start the timer. The Event Control section provides details and timing diagrams for the supported events.	1.00 Expert DFNC
TimerReset Cmd	*Off*	*Starts with the reception of the TimerReset Icommand.*	
Acquisition Start	*AcquisitionStart*	*Start Timer on Acquisition Start event.*	
Acquisition End	*AcquisitionEnd*	*Start Timer on Acquisition End event.*	
Exposure Start	*ExposureStart*	*Start Timer on Exposure Start event.*	
Exposure End	*ExposureEnd*	*Start Timer on Exposure End event.*	
Readout Start	*ReadoutStart*	*Start Timer on Readout Start event.*	
Readout End	*ReadoutEnd*	*Start Timer on Readout End event.*	
Frame Start	*FrameStart*	*Start Timer on Frame Start event.*	
Acquisition Trigger	*AcquisitionTrigger*	*Start Timer on Acquisition Trigger event.*	
Line 1 Trigger	*Line1*	*Start Timer on a transition of I/O Line 1 event.* See Input Signals Electrical Specifications.	
Line 2 Trigger	*Line2*	*Start Timer on a transition of I/O Line 2 event.*	
Line 3 Trigger	*Line3*	*Start Timer on a transition of I/O Line 3 event.*	
Line 4 Trigger	*Line4*	*Start Timer on a transition of I/O Line 4 event.*	

Timer 1 End	*Timer1End*	*Start Timer on Timer End event.*	
Counter 1 End	*Counter1End*	*Start Timer on Counter 1 End event.*	
Timer Line Activation	timerStartLineActivation	Select the trigger activation mode which starts the timer.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Starts counter on rising edge of the selected signal.*	
Falling Edge	*FallingEdge*	*Starts counter on falling edge of the selected signal.*	
Any Edge	*AnyEdge*	*Starts counter on the falling or rising edge of the selected signal.*	
Timer Delay	timerDelay	Sets the duration (in microseconds) of the delay to apply at the reception of a trigger before starting the timer.	1.00 Expert DFNC
Timer Duration	timerDuration	Sets the duration (in microseconds) of the timer pulse.	1.00 Expert DFNC
Timer Value	timerValue	Reads or writes the current value (in microseconds) of the selected timer. Writing to this feature is typically used to set the timer start value.	1.00 Expert DFNC
Timer Reset	timerReset	Resets the timer to 0 while *timerStatus=TimerActive*. Else the timer resets to 0 on the next *timerStartSource* event. (WO)	1.00 Expert DFNC

Counter and Timer Group Block Diagram

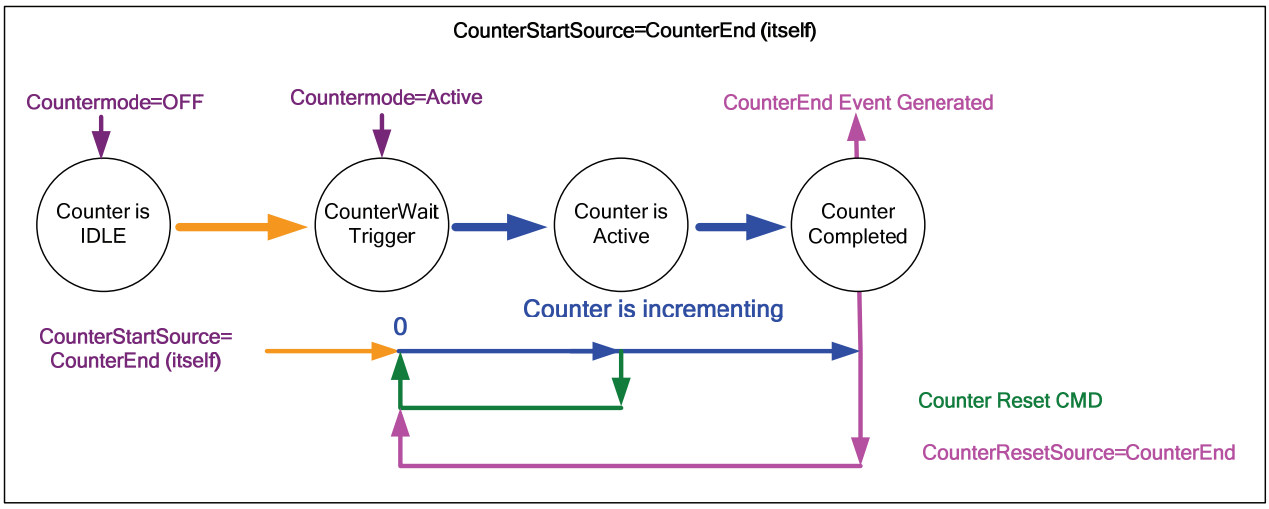


Example: Counter Start Source = OFF



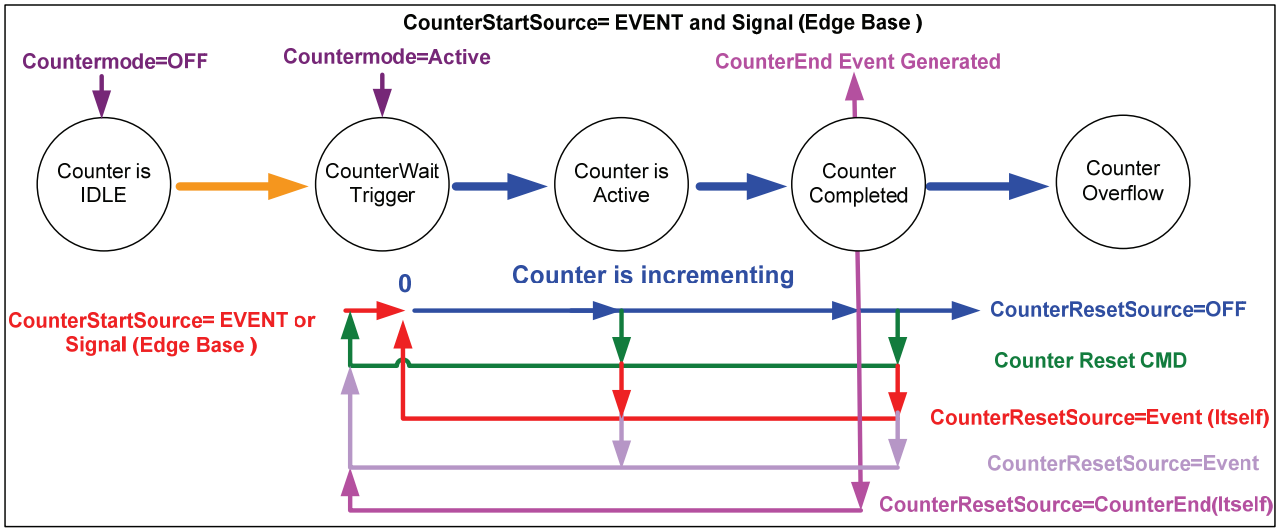
- The counter starts on the **counterReset Cmd**.
- The counter continues unless a new **counterReset Cmd** is received, which then restarts the counter at 00.
- When **Counter Reset Source= 'Event' or 'CounterEnd'** the counter is reset to 00 but does not restart counting, until the next **CounterReset Cmd**.

Example: Counter Start Source = CounterEnd (itself)

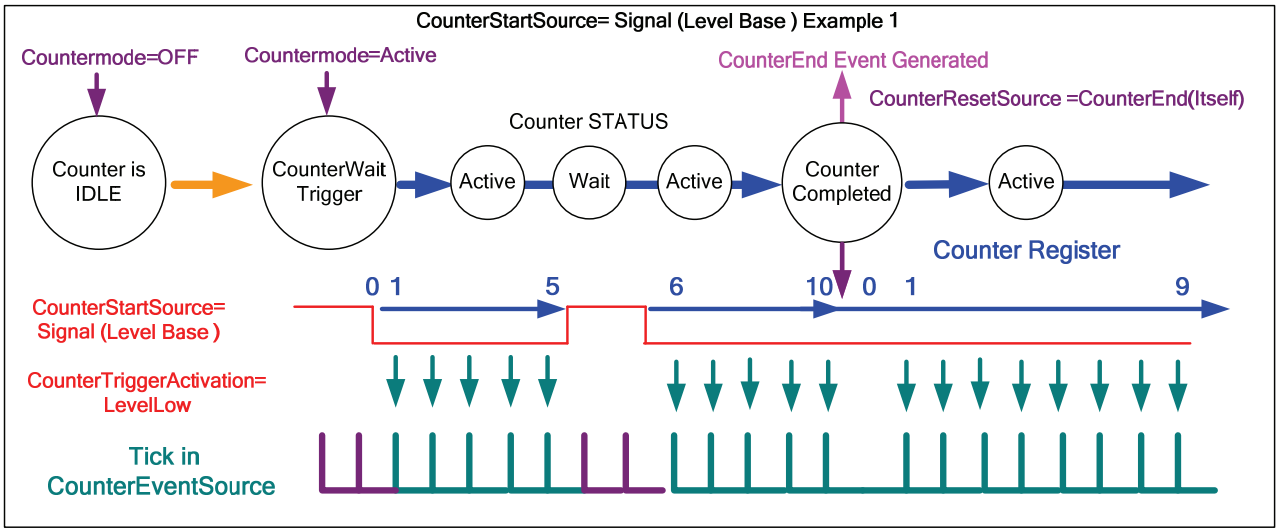


- Counter starts when Counter Mode is set to Active.
- A **Counter Reset CMD** will reset the counter to 00 and it then continues counting.
- **counterResetSource** must be set to **CounterEnd**. When the counterValue feature reaches the counterDuration value an event is generated and the counter is reset to 00, then continues.

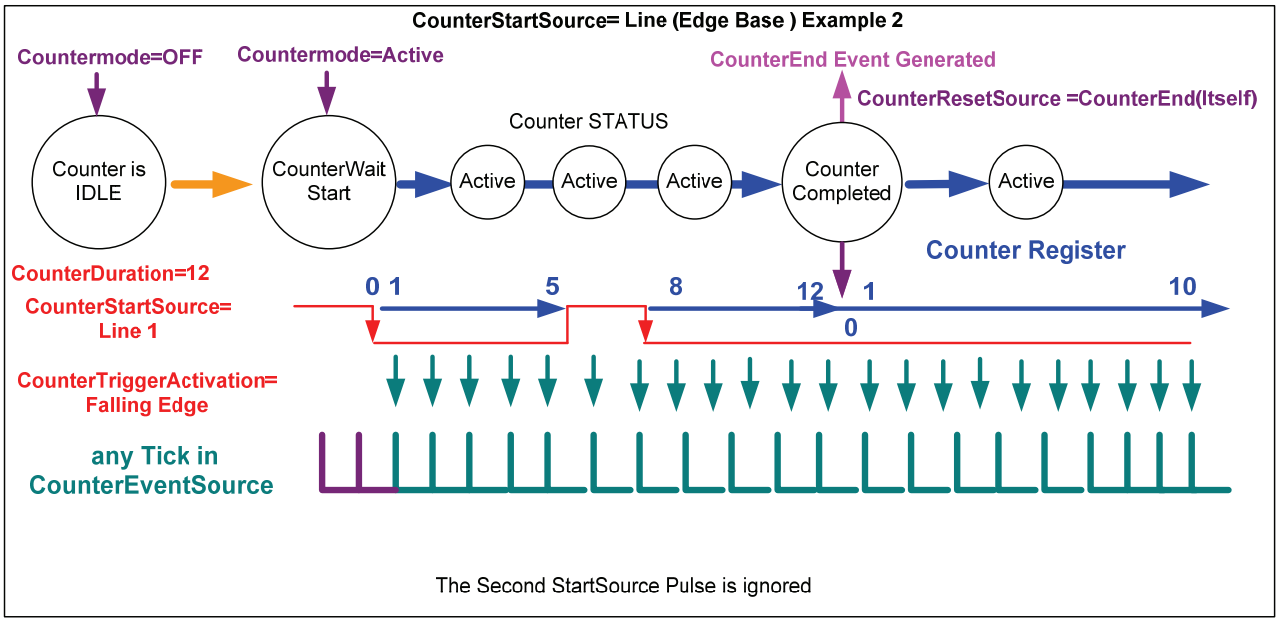
Example: CounterStartSource = EVENT and Signal (Edge Base)



Example: CounterStartSource = Signal (Level Base) Example 1



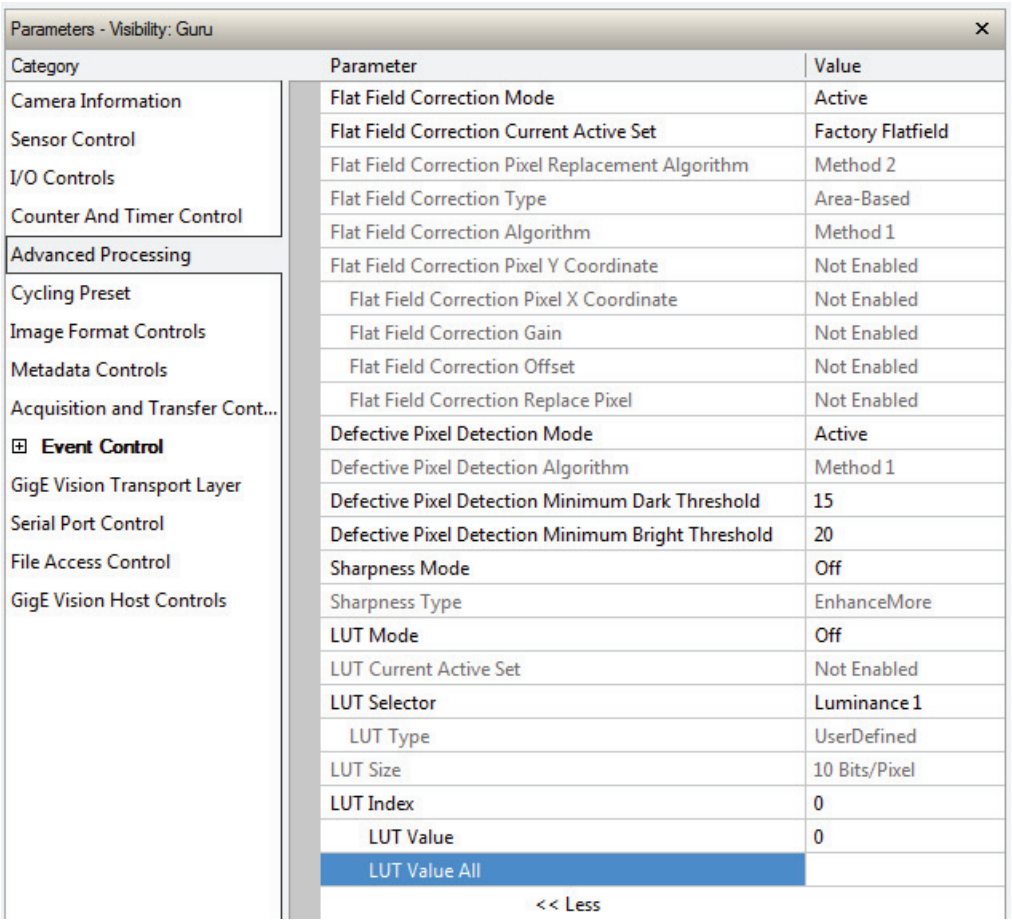
Example: CounterStartSource = Line (Edge Base) Example 2



Advanced Processing Control Category

The Genie TS Advanced Processing controls, as shown by CamExpert, groups parameters used to configure Defective Pixel Detection, and Flat Field calibration. LUT mode controls are currently supported by monochrome cameras, with color camera support available with a later device version. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Advanced Processing Control Feature Descriptions

The following table describes these features along with their view attribute and device framework version. For each feature the device version may differ for each camera sensor available and whether the camera is programmed with Standard firmware (STD), JPEG firmware (JPG), or Fast firmware (FST). Such differences will be clearly indicated for any applicable feature.

When a Device Version number is indicated, this represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

The first column indicates whether a feature applies to monochrome or color camera models via a symbol. No symbol indicates a common feature. Additionally the description column will indicate which feature is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

B/W Color	Display Name	Feature & Values	Description	Vouvray DALSA	CMOSIS CMV xx	AnaFocus Lince 5M
	Flat Field Correction Mode	flatfieldCorrectionMode	Sets the mode for the Flat Field correction. < Beginner, DFNC >	All Designs	V1.11 – STD V1.20 - JPG	—
	Off	*Off*	*Flat Field Correction is disabled.*			
	Active	*Active*	*Flat Field Correction is enabled.*			
	Calibration	*Calibration*	*When this mode is selected, the camera is configured for flat field correction calibration. The device may automatically adjust some of its features when calibrate mode is enabled. The features that are automatically adjusted are device specific. The device will not restore these features when the Flat Field Correction Mode feature is changed from Calibrate mode to another mode.*			
	Flat Field Correction Current Active Set	flatfieldCorrectionCurrentActiveSet	Specifies the current set of Flat Field coefficients to use. User data is uploaded via the file access feature. < Beginner, DFNC >	all	V1.11 – STD V1.20 - JPG	—
	Factory Flatfield	*FactoryFlatfield*	*Sets the factory Flat Field coefficient table as the current Flat Field.*			
	User Flatfield 1	*UserFlatfield1*	*Sets User Flat Field 1 coefficient table as the current Flat Field.*			
	User Flatfield 2	*UserFlatfield2*	*Sets User Flat Field 2 coefficient table as the current Flat Field.*			
	User Flatfield 3	*UserFlatfield3*	*Sets User Flat Field 3 coefficient table as the current Flat Field.*			
	User Flatfield 4	*UserFlatfield4*	*Sets User Flat Field 4 coefficient table as the current Flat Field.*			

	Flat Field Correction Pixel Replacement Algorithm	flatfieldCorrectionPixelReplacement Algorithm	Specifies the Flat Field Correction pixel replacement algorithm. < RO, Guru, DFNC >	all	V1.11 – STD V1.20 - JPG	—
	Method 1	*Method1*	*When pixel replacement is enabled, the pixel is replaced with the average value of the pixel to the left and right of the pixel to be replaced (of the same color plane).*			
	Method 2	*Method2*	*When pixel replacement is enabled, the pixel will be replaced with the Median value of the 8 surrounding pixels (3x3 kernel) in the same color plane.*			
	Flat Field Correction Type	flatfieldCorrectionType	Specifies the Flat Field correction type. < RO, Guru, DFNC >	all	V1.11 – STD V1.20 - JPG	—
	Area-Based	*AreaBase*	*Flat field correction is based on an entire image (array).*			
	Flat Field Correction Algorithm	flatfieldCorrectionAlgorithm	Specifies the Flat Field correction algorithm to use. < RO, Guru, DFNC >	all	V1.11 – STD V1.20 - JPG	—
	Method 1	*Method1*	*The following formula is used to calculate the flat field corrected pixel: newPixelValue[x][y] = (sensorPixelValue[x][y] - FFCOffset[x][y]) * FFCGain[x][y]*			
	Flat Field Correction Pixel Y Coordinate	flatfieldCorrectionPixelYCoordinate	Specifies the Y coordinate of the flat field pixel coefficient to access. < Guru, DFNC >	all	V1.11 – STD V1.20 - JPG	—
	Flat Field Correction Pixel X Coordinate	flatfieldCorrectionPixelXCoordinate	Specifies the X coordinate of the flat field pixel coefficient to access. < Guru, DFNC >	all	V1.11 – STD V1.20 - JPG	—
	Flat Field Correction Gain	flatfieldCorrectionGain	Sets the gain to apply to the currently selected pixel. < Guru, DFNC >	all	V1.11 – STD V1.20 - JPG	—
	Flat Field Correction Offset	flatfieldCorrectionOffset	Sets the offset to apply to the currently selected pixel. < Guru, DFNC >	all	V1.11 – STD V1.20 - JPG	—
	Flat Field Correction Replace Pixel	flatfieldCorrectionReplacePixel	Sets the enable state for pixel replacement of the currently selected pixel. < Guru, DFNC >	all	V1.11 – STD V1.20 - JPG	—
		Off *Active*	*Enable pixel replacement.*			
	Defective Pixel Replacement Mode	defectivePixelReplacementMode	Sets the mode for the defective pixel replacement. Requires an acquisition of 4 lines minimum. < Expert, DFNC >	—	—	V1.20
	Off	*Off*	*Defective Pixel Replacement is disabled*			
	Active	*Active*	*Defective Pixel Replacement is enabled*			
	Defective Pixel Replacement Map Current Active Set	defectivePixelReplacementMapCurrent ActiveSet	Sets the defective pixel replacement set. < Expert, DFNC >	—	—	V1.20
	Factory Map	*FactoryMap*	*Sets the factory coefficient table as active.*			
	User Map 1	*UserMap1*	*Sets the User Map 1 coefficient table as active.*			

	Defective Pixel Detection Mode	defectivePixelDetectionMode	Sets the mode for a Dynamic Defective Pixel Detection and replacement function. < Expert, DFNC >	STD	STD Fast	—
	Off	*Off*	*Defective Pixel Detection is disabled.*			
	Active	*Active*	*Defective Pixel Detection and replacement is enabled.*			
	Defective Pixel Detection Algorithm	defectivePixelDetectionAlgorithm	Defective Pixel Detection Algorithm used in the Defective Pixel Detection Function. < RO, Guru, DFNC >	STD	STD Fast	—
	Method 1	*Method1*	*Proprietary function to Teledyne DALSA.*			
	Method 2	*Method2*	*Proprietary function to Teledyne DALSA (applies to color Bayer Sensor)*			
	Defective Pixel Detection Minimum Dark Threshold	defectivePixelDetectionMinDark Threshold	Sets the minimum DN difference between a pixel in the dark and its neighborhood before it's tagged as defective. < Expert, DFNC >	V1.10 - all	STD Fast	—
	Defective Pixel Detection Minimum Bright Threshold	defectivePixelDetectionMinBright Threshold	Sets the minimum DN difference between a pixel in the bright and its neighborhood before it's tagged as defective. < Expert, DFNC >	V1.10 - all	STD Fast	—
	Automatic White Balance	BalanceWhiteAuto	Controls the mode for automatic white balancing between the color channels. The color gains are automatically adjusted. <Expert>	V1.20	V1.20	—
	Off	*Off*	*White balancing is manually controlled using DigitalRed, DigitalGreen and DigitalBlue.*			
	OnDemand	*OnDemand*	*White balancing is automatically adjusted once by the device.*			
	White Balance On-Demand Cmd	balanceWhiteAutoOnDemandCmd	Executes the automatic white balance function. The first frame acquired is used to calculate the RGB gain adjustments, which are then applied to subsequent snaps or grabs. < Expert, DFNC >	V1.20	V1.20	—
	White Balance Ratio Reference Component	balanceRatioReference	Selects which color component to use as the reference point for BalanceWhiteAuto. < Expert, DFNC >	V1.20	V1.20	—
	Red	*Red*	*Red component will remain constant after the white balance adjustment.*			
	Green	*Green*	*Green component will remain constant after the white balance adjustment.*			
	Blue	*Blue*	*Blue component will remain constant after the white balance adjustment.*			
	Auto	*Auto*	*The reference color component is automatically selected so that the minimum component's gain becomes 1.00.*			

	White Balance ROI Mode	balanceWhiteROIMode	When active, the White Balance algorithm limits analysis to the ROI image area to determine the white balance adjustments. If auto-brightness mode is enabled, the white balance ROI is equal to the auto-brightness ROI < Expert, DFNC >	V1.20	V1.20	—
	Off	*Off*	*All of the output image is used in the White Balance algorithm.*			
	Active	*Active*	*The selected ROI is used in the White Balance algorithm.*			
	White Balance ROI Width	balanceWhiteROIWidth	Specifies the width of the White Balance ROI. < Expert, DFNC >	V1.20	V1.20	—
	White Balance ROI Height	balanceWhiteROIHeight	Specifies the height for the White Balance ROI. < Expert, DFNC >	V1.20	V1.20	—
	White Balance ROI Offset X	balanceWhiteROIOffsetX	Specifies the offset from the image origin along the X-axis for the White Balance ROI. < Expert, DFNC >	V1.20	V1.20	—
	White Balance ROI Offset Y	balanceWhiteROIOffsetY	Specifies the offset from the image origin along the Y-axis for the White Balance ROI. < Expert, DFNC >	V1.20	V1.20	—
	Color Correction Mode	colorCorrectionMode	Sets the color correction feature to manual or automatic. < Expert, DFNC >	V1.20	V1.20	—
	Off	*Off*	*The RGB gains are manually controlled using the Gain feature.*			
	Active	*Active*	*The RGB gains are automatically controlled by the color correction matrix.*			
	Color Correction Current Active Set	colorCorrectionCurrentActiveSet	Specifies the active set of color correction coefficients. < Beginner, DFNC >	V1.20	V1.20	—
	Factory Preset	*FactoryPreset*	*Loads the factory color correction coefficient set as the active set.*			
	User Defined	*UserDefined*	*Loads a user-defined color correction coefficient set as the active set.*			
	Color Correction Algorithm	colorCorrectionAlgorithm	Select the Color Correction Algorithm from the supported methods. < Guru, DFNC >	V1.20	V1.20	—
	Method 4	*Method4*	*Linear 3x4 transformation matrix (low complexity).*			
	Color Light Source	colorLightSource	Select the set of color correction coefficients calibrated for a given light source. < Beginner, DFNC >	V1.20	V1.20	—
	White LED	*WhiteLED_1*	*Typical white LED with primary spectrum peak at 450 nm and secondary phosphor around 560 nm.*			
	Xenon	*Xenon*	*Typical Xenon wide spectrum white light strobe.*			
	Correlated Color Temperature	correlatedColorTemperatureList	Select the Correlated Color Temperature from the available values in degree Kelvin. < Expert, DFNC >	V1.20	V1.20	—

	3300 K	*CCT_3300K*				
	3500 K	*CCT_3500K*				
	4875 K	*CCT_4875K*				
	5650 K	*CCT_5650K*				
	5800 K	*CCT_5800K*				
	7000 K	*CCT_7000K*				
	Color Correction Spectrum Range	colorCorrectionSpectrumRange	Select the Color Correction Spectrum Range used. The user is responsible for installing an external IR filter when required. < Beginner, DFNC >	V1.20	V1.20	—
	Visible Light 380 to 650nm	*VisibleLight380to650nm*	*Images taken with a low pass IR filter passing light below 650 nm.*			
	Visible And Near Infrared Light	*VisibleAndNearInfraredLight*	*Images taken without an IR filter.*			
	Color Saturation Control	colorEnhancementControl	User set gain on the color saturation component, ranging from 0 to 4x. < Beginner, DFNC >	V1.20	V1.20	
	Sharpness Mode	sharpnessMode	Sets the enable state of the sharpness feature available with monochrome cameras. Requires an acquisition of 4 lines minimum. < Expert, DFNC >	STD	STD	—
	Off	*Off*	*Disables Image Sharpness feature.*			
	Active	*Active*	*Enables Image Sharpness feature.*			
	Sharpness Type	sharpnessType	Selects the type of image filter to apply. < Expert, DFNC >	STD	STD	—
	Smoothing More	*EnhanceMore*	*Smoothing More image filter*			
	Smoothing Less	*EnhanceLess*	*Smoothing Less image filter*			
	Sharpen Less	*SharpenLess*	*Sharpen Less image filter*			
	Sharpen More	*SharpenMore*	*Sharpen More image filter*			
	LUT Mode	lutMode	Sets the enable state of the selected LUT (Lookup Table). < Expert, DFNC >	all	STD JPEG	—
	Off	*Off*	*Disables the LUT.*			
	Active	*Active*	*Enables the selected LUT.*			
	LUT Type	lutType	Displays the LUT type of the currently selected Lookup Table. < Expert, DFNC >	V1.20	V1.20	
	User Defined	*UserDefined*	*Uses the user programmable LUT.*			
	Gamma Correction	*GammaCorrection*	*Uses gamma LUT*			
	Gamma Correction	gammaCorrection	Sets the gamma correction factor (i.e. inverse gamma). The gamma correction is applied as an exponent to the original pixel value. < Expert, DFNC >	V1.20	V1.20	—

	LUT Current Active Set	lutCurrentActiveSet	Specifies the current LUT to use. LUT data is uploaded with the file access features. < Expert, DFNC >	all	all	Fast
	Luminance 1 *Luminance 2* *Luminance 3* *Luminance 4*	*Luminance1* *Luminance2* *Luminance3* *Luminance4*	*Sets the current LUT as Luminance 1.* *Sets the current LUT as Luminance 2.* *Sets the current LUT as Luminance 3.* *Sets the current LUT as Luminance 4.*	V1.20	V1.20	
	LUT RGB	*RGB*	*Sets the current LUT as RGB.*			
	LUT Selector	LUTSelector	Selects which LUT to control and adjust features. < Guru >	all	all	Fast
	Luminance 1 *Luminance 2* *Luminance 3* *Luminance 4*	*Luminance1* *Luminance2* *Luminance3* *Luminance4*	*Luminance 1 is under control* *Luminance 2 is under control* *Luminance 3 is under control* *Luminance 4 is under control*	V1.20	V1.20	
	Red *Green* *Blue*	*Red* *Green* *Blue*	*LUT Red is under control* *LUT Green is under control* *LUT Blue is under control*			
	LUT Size	lutSize	Specify the LUT size of the selected LUT (Lookup Table). < RO, Guru, DFNC >			
	10 Bits/Pixel *8 Bits/Pixel*	*Bpp10* *Bpp8*	*10 bits per pixel* *8 bits per pixel*	all —	all —	—
	LUT Index	LUTIndex	Selects the index (offset) of the coefficient to access in the selected LUT. < Guru >	all	all	—
	LUT Value	LUTValue	Returns the value at specified LUT index entry of the LUT selected by the LUT Selector feature. < Guru >	all	all	—
	LUT Value All	LUTValueAll	Accesses all the LUT coefficients in a single access without using individual LUT indices. This feature accesses the LUT values in the currently active LUT table set by the LUT Current Active Set feature. < Guru >	all	all	—
	Image Compression Mode	ImageCompressionMode	Enable the Image Compression Mode. < Beginner >	V1.20 - JPG	V1.20 - JPG	
	Off	*Off*	*No image compression selected.*			
	JPEG	*Jpeg*	*Jpeg image compression selected.*			
	Image Compression Rate Option	ImageCompressionRateOption	Select the image compression rate option. Useful for *when image processing algorithms are sensitive to image degradation caused by excessive data compression.* < Expert>	V1.20 - JPG	V1.20 - JPG	
	Fixed Quality	*FixQuality*	*Output stream has a constant image quality.*			
	Image Compression Quality	ImageCompressionQuality	Set the quality factor for the camera's compressed image stream. (Min=1, Max=99) < Expert >	V1.20 - JPG	V1.20 - JPG	
	Image Compression Jpeg Format Option	ImageCompressionJpegFormatOption	Select the JPEG image compression format type.	V1.20 - JPG	V1.20 - JPG	

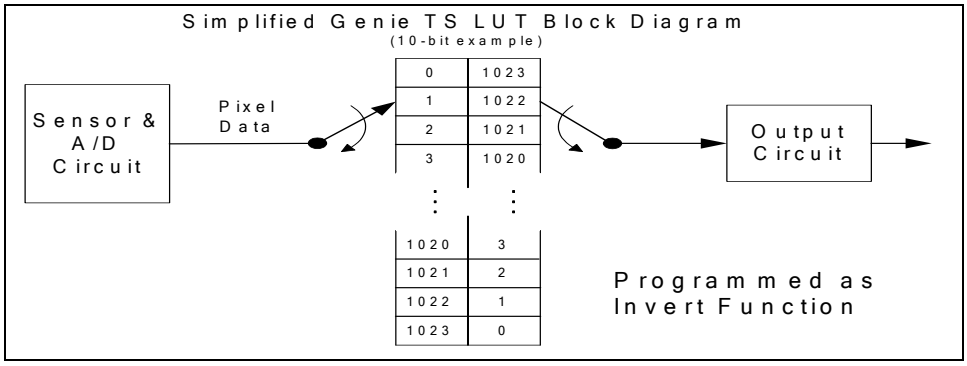
	BaseLine Standard	*BaseLineStandard*	*Indicates this is a baseline sequential (single-scan) DCT-based JPEG.*			
	Defective Pixel Detection Deviation	defectivePixelDetectionDeviation	DEPRECATED. Use defectivePixelDetectionMinBrightThreshold and defectivePixelDetectionMinDarkThreshold. < Invisible, DFNC >	all	—	—
	Defective Pixel Detection Minimum Dark Threshold (Raw)	defectivePixelDetectionMinDark ThresholdRaw	Sets the minimum DN difference between a dark pixel and its neighborhood before it is tagged as defective. < Invisible, DFNC >	V1.10 - all	V1.10	—
	Defective Pixel Detection Minimum Bright Threshold (Raw)	defectivePixelDetectionMinBright ThresholdRaw	Sets the minimum DN difference between a bright pixel and its neighborhood before it is tagged as defective. < Invisible, DFNC >	V1.10 - all	V1.10	—
	Processing path bits per pixel	processingPathBpp	Bits per pixel for the camera processing path. < RO, Invisible, DFNC >	all	all	all
	Processing path max bits per pixel	processingPathBppMax	Maximum bits per pixel for the camera processing path. < Invisible, DFNC >	V1.10 - all	all	—
	Flat Field Algorithm Buffer Format	flatfieldAlgorithmBufferFormat	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD JPG	—
		Mono8				
	Flat Field Algorithm Buffer Width	flatfieldAlgorithmBufferWidth	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Flat Field Algorithm Buffer Height	flatfieldAlgorithmBufferHeight	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Flat Field Algorithm Gain Max	flatfieldAlgorithmGainMax	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Flat Field Algorithm Gain Min	flatfieldAlgorithmGainMin	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Flat Field Algorithm Gain Divisor	flatfieldAlgorithmGainDivisor	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Flat Field Algorithm Gain Base	flatfieldAlgorithmGainBase	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Flat Field Algorithm Offset Max	flatfieldAlgorithmOffsetMax	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Flat Field Algorithm Offset Min	flatfieldAlgorithmOffsetMin	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Flat Field Algorithm Offset Factor	flatfieldAlgorithmOffsetFactor	Internal use for Sapera FFC Class library. < RO, Invisible, DFNC >	all	STD	—
	Correlated Color Temperature	correlatedColorTemperature	Set the color temperature for the color calibration matrix. The color temperature is stated in Kelvin. < Invisible, DFNC >	V1.20	V1.20	—
	Color Enhancement Selector	colorEnhancementSelector	Select the active Color Enhancement coefficient set. < Invisible, DFNC >	V1.20	V1.20	—

	Factory Preset	*FactoryPreset*	*Loads the factory color enhancement coefficient set as the active set.*			
	User Defined	*UserDefined*	*Loads a user-defined color enhancement coefficient set as the active set.*			

Lookup Table (LUT) Overview

The Genie TS monochrome camera includes 4 user programmable LUT tables as components of its embedded processing features. A LUT is used for operations such as gamma adjustments, invert and threshold processes.

The monochrome camera LUT table is a 10-bit or 12-bit LUT (per pixel – see feature *LUT Size*) as illustrated in the following figure (see *Processing path bits per pixel*). Pixel data when read out of the sensor is passed through the LUT memory array, where the new programmed pixel value is then passed to the Genie output circuit. The LUT data table is stored along with other parameters with the user configuration function.



Simplified 10-bit LUT Block Diagram

Sharpness Type Overview

When activating the monochrome camera feature *sharpnessMode*, the feature *sharpnessType* selects the sharpening function applied to the image. The image filter functions utilize 3x3 matrix coefficients as described below.

The sharpening function requires a minimal acquisition of 4 lines. An acquisition of less vertical lines is not supported by this correction algorithm.

Name: Smoothing More

Scale Value = 1/9.0

+1	+1	+1
+1	+1	+1
+1	+1	+1

Name: Smoothing Less

Scale Value = 1/32.0

+1	+4	+1
+4	+12	+4
+1	+4	+1

Name: Sharpen Less

Scale Value = 1/2.0

-1	-1	-1
-1	+10	-1
-1	-1	-1

Name: Sharpen More

Scale Value = 1/1.0

-1	-1	-1
-1	+9	-1
-1	-1	-1

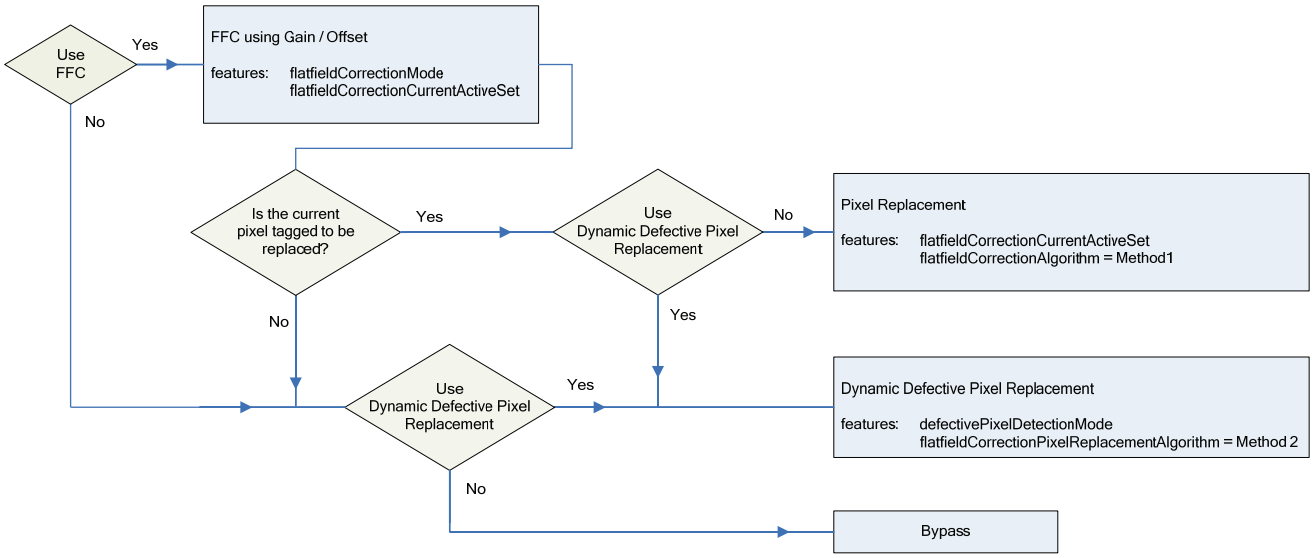
Flat Field Correction and Defective Pixel Detection Overview

The Flat Field correction function (FFC) consists of using two coefficients per pixel which correct the gain and offset of the corresponding pixel. These corrections compensate for Photo-response Non-uniformity (PRNU) and Fix Pattern noise (FPN), unique to each camera sensor. In addition a third correction element detects defective pixels (hot, cold, blinking) and replaces them with a value based on neighborhood pixels.

With CMOS sensors, it is imperative to perform FFC calibration under the same conditions the camera is to be used in. The exposure time and camera internal temperature need to be similar to the expected operating conditions, else CMOS sensor variations (over temperature and exposure) will render the FFC calibration invalid. Genie TS camera have multiple FFC user memory spaces to store calibration data for different operating conditions. This allows users to store FFC data for different optimized exposure setups.

Correction Function Block Diagram

The following simplified block diagram shows that sensor data can have FFC applied or it can bypass that stage. If FFC is true, then the choice of standard pixel replacement or Dynamic Defective Pixel detection is made. Else Dynamic Defective Pixel detection can be enabled without FFC, or all correction modes can be bypassed.



Flat Field Correction Algorithm Description

Flat Field Correction Algorithm–Method1 (feature: flatfieldCorrectionAlgorithm) applies the following FFC formula for correcting pixel values.

newPixelValue[x][y] = (sensorPixelValue[x][y] - FFCOffset[x][y]) * FFCGain[x][y]

where:

- [**x**] & [**y**] are the Flat Field Correction Pixel coordinates.
  See the *FlatfieldCorrectionPixelXCoordinate* and *FlatfieldCorrectionPixelYCoordinate* features.
- **newPixelValue** is the pixel value after Flat Field Correction is applied.
- **sensorPixelValue** is the pixel value before Flat Field correction is applied.
- **FFCOffset** is the offset coefficient value to subtract from the sensorPixelValue.
- **FFCGain** is the gain coefficient value that is multiplied with the sensorPixelValue.

Important: FFCOffset and FFCGain are derived factors calculated from a number of camera specific feature values (Invisible DFNC features). Reading these values directly from the Flat Field Coefficients file will be meaningless to the user. If your application requires writing valid replacement values in the coefficients file, contact Teledyne DALSA for application specific information (request application note *Genie_TS_FFC_AN001.pdf*).

Information on the Sapera Flat Field Coefficients File

The Flat Field Coefficients File is a standard 8-bit TIFF file for both 10-bit and 8-bit acquisition modes. If the Flat Field calibration is made while using a 10-bit buffer, the user Flat Field calibration coefficients file is applicable to both 10-bit or 8-bit acquisitions. If the Flat Field calibration is made while using an 8-bit buffer, then there will be missing coefficients if the user changes to a 10-bit acquisition.

A Sapera application (such as CamExpert) creates a new SapBuffer object of the same width as the image buffer but with twice the number of lines. This provides the room to store both offset and gain Flat Field data. The Flat Field offset data is contained in the top half of the new buffer, while the gain buffer is in the bottom half.

A Sapera application saves the new buffer using SapBuffer::Save with the "-format tiff" option, which allows saving data without loss of significant bits.

Note: If the offset data = 0xff, then that is a special flag, indicating that the pixel is replaced with an adjacent pixel, without any calculation. This is the factory calibration technique for elimination of dead or hot pixels. A pixel on the left edge (beginning of the line) would be replaced with the pixel to its right, while a pixel on the right edge (end of the line) is replaced with the pixel to its left. Any pixel within a line is replaced with the average of the its neighboring pixels (on the same line). For color sensors, the same algorithm is used except the replacement pixel is of the same color.

Important Factors about Flat Field Processing

Important: Before calibration, the Genie should be powered on long enough to achieve its nominal temperature (a minimum of 30 minutes). A low ambient temperature may increase the time required for the Genie to reach a stable internal temperature.

Important: During calibration, no other Genie features should be accessed or modified. The calibration process will disable functions such as binning, image crop or flip setting. These features need to be re-enabled after the flat field calibration completes.

Calibration via CamExpert or via a User Application: Exposure and frame rates used during a Flat Field Calibration should be similar to the exposure settings used in the camera application.

Defective Pixel Replacement

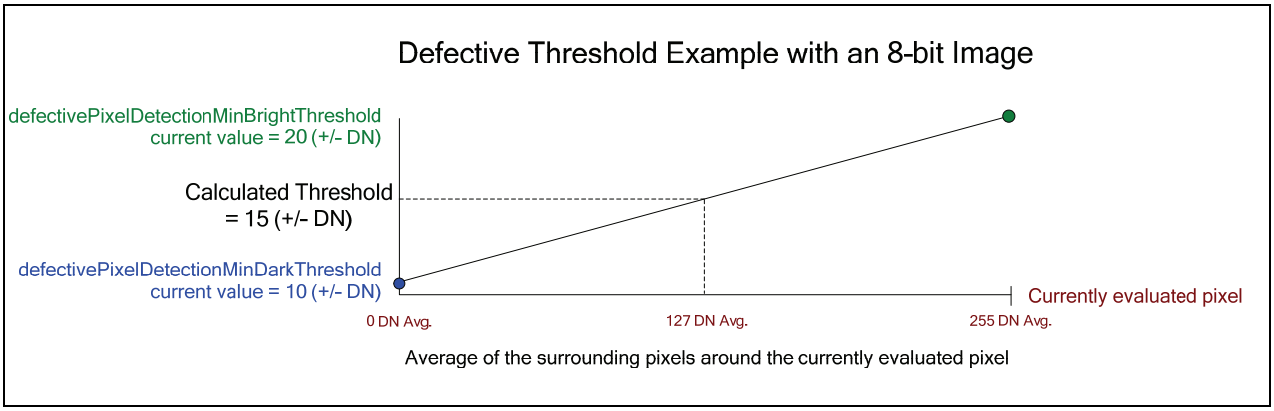
The Pixel Replacement algorithm is based on a predefined pixel map (requires FFC enabled) and/or the dynamic results of the feature defectivePixelDetectionMode. The pixel replacement is controlled by the feature flatfieldCorrectionPixelReplacementAlgorithm=Method 1 or 2.

Defective Pixel Detection Algorithm Description

- Defective Pixel Replacement requires a minimal acquisition of 4 lines. An acquisition of less vertical lines is not supported by this correction algorithm.
- This proprietary detection algorithm compares each image pixel with its neighborhood.
- When the feature *defectivePixelDetectionMode* is active, the comparison thresholds are set by the features *defectivePixelDetectionMinBrightThreshold* and *defectivePixelDetectionMinDarkThreshold*.
- When a pixel is identified as exceeding the dark and bright thresholds, the pixel is replaced by the feature *flatfieldCorrectionPixelReplacementAlgorithm=Method 2*.

Referring to the following graphic:

- Each image pixel is compared with its 3x3 neighborhood.
- If a dark pixel is *more* different than its neighbors by the value of *defectivePixelDetectionMinDarkThreshold,* then it is replaced.
- If a bright pixel is *more* different than its neighbors by the value of *defectivePixelDetectionMinBrightThreshold,* then it is replaced.
- If a pixel is more different than its neighbors by a threshold value calculated from the difference between the bright and dark thresholds, then it is replaced. As shown in the example graphic, a pixel difference of 15 would be replaced when the neighborhood average is DN=127 (for an 8-bit image).


Defective Threshold Example with an 8-bit Image
defectivePixelDetectionMinBrightThreshold
current value = 20 (+/- DN)
Calculated Threshold
= 15 (+/- DN)
defectivePixelDetectionMinDarkThreshold
current value = 10 (+/- DN)
Currently evaluated pixel
0 DN Avg.
127 DN Avg.
255 DN Avg.
Average of the surrounding pixels around the currently evaluated pixel

How to do a FFC Setup via Sapera CamExpert 12

The Sapera LT CamExpert tool provides an easy GUI based method for a user to perform a Flat Field Calibration. The process first requires the user to plan acquisitions in dark and bright conditions, followed by the FFC process itself. These steps are detailed below and must be preceded by disabling functions such as binning, image crop or flip settings.

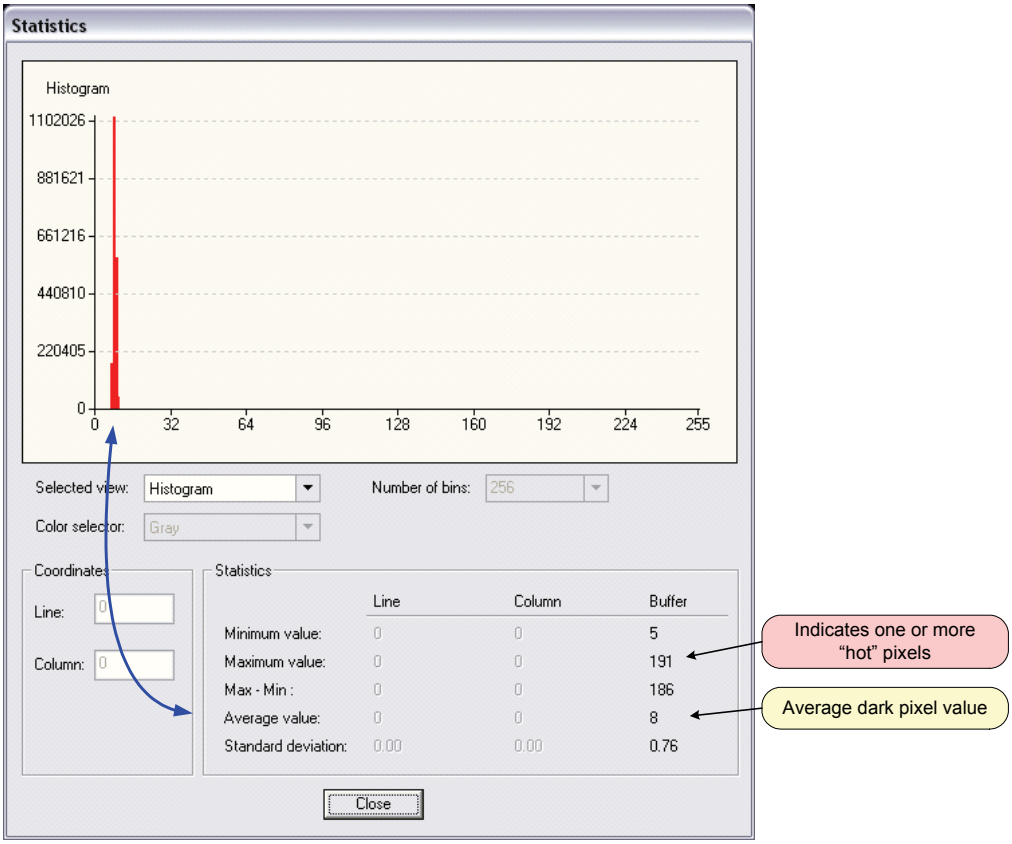
Set up Dark and Bright Acquisitions with the Histogram Tool

Before performing calibration, verify Genie acquisition with a live grab. Also at this time make preparations to grab a flat light gray level image, required for the calibration, such as a clean

evenly lighted white wall or non-glossy paper with the lens slightly out of focus. Ideally a controlled diffused light source aimed directly at the lens should be used. Note the lens iris position for a bright but not saturated image. Additionally check that the lens iris closes well and have a lens cover to grab the dark calibration image.

Verify a Dark Acquisition

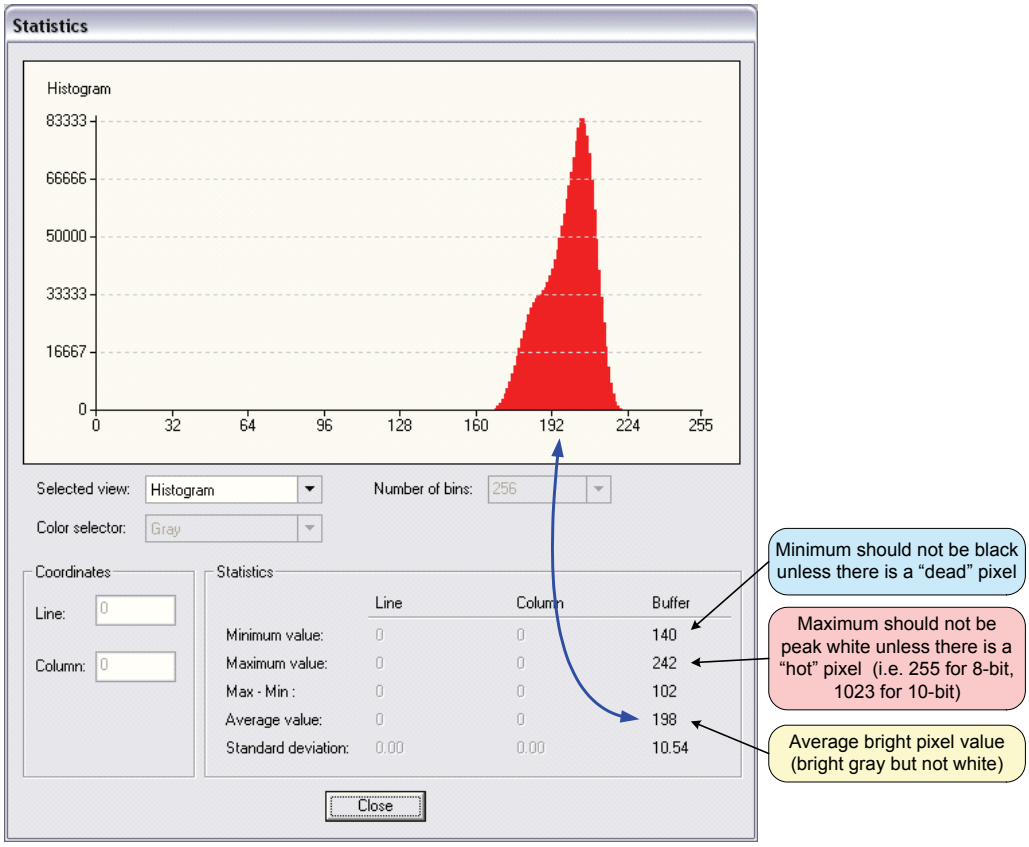
Close the camera lens iris and cover the lens with a lens cap. Using CamExpert, click on the grab button and then the histogram button. The following figure shows a typical histogram for a Genie grabbing a very dark image.



	Important: In this example, the **average** pixel value for the frame is close to black. Also note that most sensors will show a much higher maximum pixel value due to one or more "hot pixels". The sensor specification accounts for a small number of hot or stuck pixels (pixels that do not react to light over the full dynamic range specified for that sensor).

Verify a Bright Acquisition

Aim the camera at a diffused light source or evenly lit white wall with no shadows falling on it. Using CamExpert, click on the grab button and then the histogram button. Use the lens iris to adjust for a bright gray approximately around a pixel value of 200 (for 8-bit pixels). The following figure shows a typical histogram for a Genie grabbing a bright gray image.



	Important: In this example, the **average** pixel value for the frame is bright gray. Also note that sensors may show a much higher maximum or a much lower minimum pixel value due to one or more "hot or dead pixels". The sensor specification accounts for a small number of hot, stuck, or dead pixels (pixels that do not react to light over the full dynamic range specified for that sensor).

Once the bright gray acquisition setup is done, note the camera position and lens iris position so as to be able to repeat it during the calibration procedure.

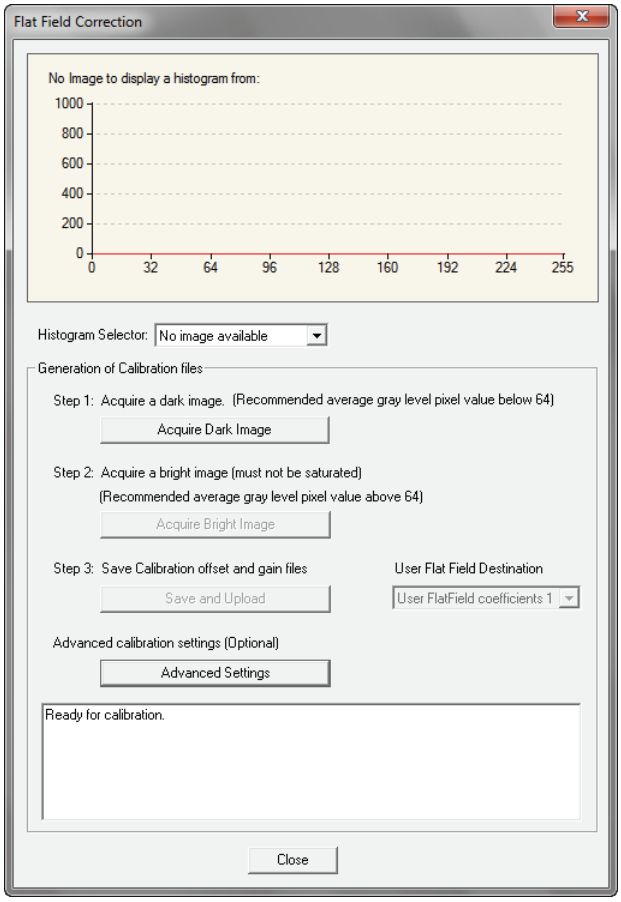
Flat Field Correction Calibration Procedure

The following procedure uses the CamExpert Flat Field tool. Calibration is the process of taking two reference images, one of a dark field – one of a bright field (not saturated), to generate correction data for images captured by Genie. Each sensor pixel data is modified by the correction factor generated by the calibration process, so that each pixel has an identical response to the same illumination.

- Start the Flat Field calibration tool via the CamExpert menu bar:
  Pre-processing • Flat Field Correction • Calibration.

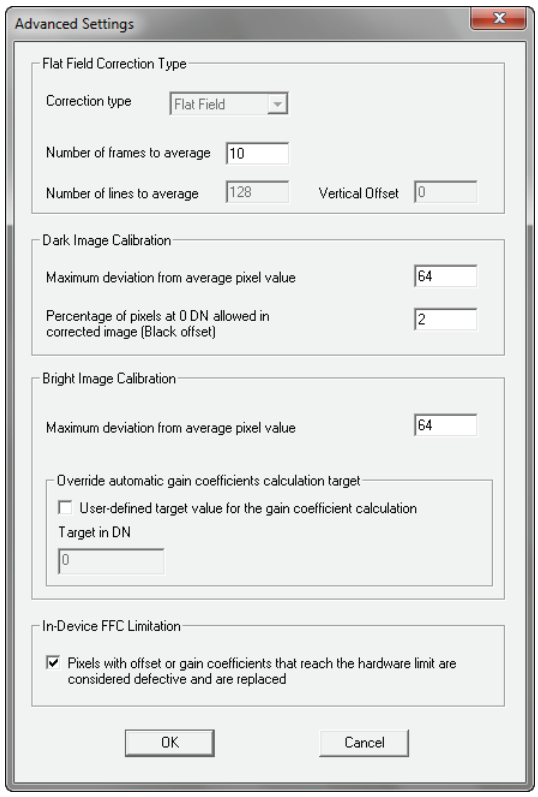
Flat Field Calibration Window

The Flat Field calibration window provides a three step process to acquire two reference images and then save the flat field correction data for the Genie used. To aid in determining if the reference images are valid, a histogram tool is provided so that the user can review the images used for the correction data. Note that it is important to follow the instructions in the preceding section to prepare for the dark and light acquisition steps required for calibration.



CamExpert Flat Field Calibration Menu

- Click on the **Advanced Setting** button to change the default number of frames averaged for each calibration step. The default value is 10 frames (as performed by CamExpert).



- Setup the camera to capture a uniform dark image. Black paper with no illumination and the camera lens' iris closed to minimum can provide such a dark image. Or cover the lens with a black lens cap.
- Click on **Acquire Black Image**. The flat field calibration tool will grab video frames, analyze the pixel gray level spread, and present the statistics. The desired black reference image should have pixel values less then 20. If the results are acceptable, accept the image as the black reference.
- Setup the camera to acquire a uniform white image (but not saturated white). Even illumination on white paper can be used, with a gray level of minimum of 128 (8-bit mode). It is preferable to prepare for the white level calibration step before starting the calibration procedure (see the previous section for information).
- Click on **Acquire White Image**. The flat field demo will grab video frames, analyze the pixel gray level spread, and present the statistics. The captured gray level for all pixels should be greater than 128 but not saturated. If the histogram shows a good grab accept the image as the white reference.
- Click on **Save**. The flat field correction data is saved as a TIF image with a file name of your choice (suggestions are the camera name and its serial number). The FFC data file is uploaded to the Genie TS via the file access features.

Using Flat Field Correction

When using CamExpert, from the menu bar enable Flat Field correction (Pre-Processing • Flat Field Correction • Hardware). Now when doing a live grab or snap, the incoming image is corrected by the current flat field calibration data for each pixel.

Use the CamExpert menu function Tools • Flat Field Correction • Load to load in a flat field correction image from previously saved calibration data. CamExpert allows saving and loading calibration data for all cameras used with the imaging system.

GigE Vision application implement features as described in the section Advanced Processing controls.

Image Compression Mode (JPEG) Controls

Image Compression requires the JPEG Design firmware. This is an advanced processing design to provide JPEG image accelerated compression, maximizing video frame transmissions over the Ethernet network. Smaller compressed images take less network bandwidth allowing multiple cameras (connected via a switch) on a network to efficiently transmit video frames to the host system.

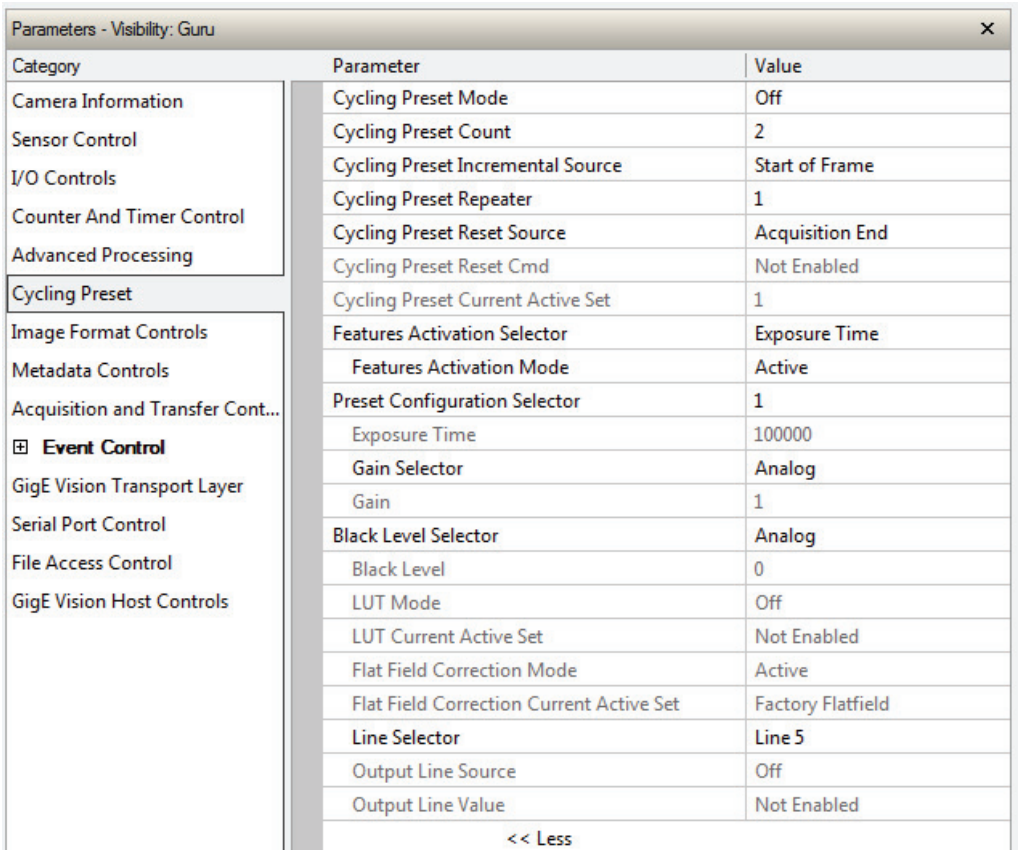
- The user uploads the new firmware using the File Access Control features as shown by CamExpert.
- Enable Compression (*ImageCompressionMode*) to enable the embedded JPEG mode. When compression is Off, the camera output stream is identical to the images when the default Standard design firmware is loaded.
- The Compression Rate feature (*ImageCompressionRateOption*) is currently set to Fixed Quality, where the output image has a non-varying quality. Alternative image quality options may be available in the future.
- The Compression Quality feature (*ImageCompressionQuality*) allows the user to choose the degree of compression, set by a number within the range of 1 to 99. The value 99 sets minimum compression where typical images are compressed by a factor of 2. The value of 80 still provides reasonable image quality, but lower values visibly trade off image quality for smaller image sizes.
- The JPEG Format option (*ImageCompressionJpegFormatOption*) defines the active format as BaseLine Standard; a common industry JPEG format.
- The JPEG compression process is within the Genie TS (via the JPEG Design firmware). The images output are complete with the required jpeg metadata. Any captured and saved image when using the CamExpert tool, simply needs its file extension changed to "jpg", where then it is readable by any image viewer or editor.
- The CamExpert tool in Sapera LT 7.50 (or later) supports decoding the captured JPEG directly.
- The host software must account for the variable timing between data packets coming from the Genie TS by increasing the Inter-packet timeout feature value. The Sapera package automatically increases the feature value, while third party GigE Vision Host software must be adjusted by the user. See the section "*Inter-Packet Timeout with JPEG Designs*" in the "Teledyne DALSA Network Imaging Module for Sapera LT" manual for additional information.

Cycling Preset Mode Control Category

The Genie TS Cycling Preset controls, as shown by CamExpert, groups parameters used to configure the camera Cycling features. Cycling controls allow the user to configure a number of camera operational states and then have the camera automatically switch between states in real-time. Only the features programmed to change are updated when switching between camera states, thus ensuring immediate camera response. A setup example follows the feature table.

Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Cycling Preset Mode Control Feature Description

The following table describes these features along with their view attribute and device framework version. For each feature the device version may differ for each camera sensor available and whether the camera is programmed with Standard firmware (STD), JPEG firmware (JPG), or Fast firmware (FST). Such differences will be clearly indicated for any applicable feature.

When a Device Version number is indicated, this represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

The first column indicates whether a feature applies to monochrome or color camera models via a symbol. No symbol indicates a common feature. Additionally the description column will indicate which feature is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

B/W Color	Display Name	Feature & Values	Description	Vouvray DALSA	CMOSIS CMX xx	AnaFocus Lince 5M
	Cycling Preset Mode	cyclingPresetMode	Sets the Cycling Presets module mode. < Expert, DFNC >	V1.10 All Designs	V1.10 All Designs	V1.20 Fast
	Off	*Off*	*Disable the Cycling Preset module.*			
	Active	*Active*	*Enable the Cycling Preset module.*			
	Cycling Preset Count	cyclingPresetCount	Specifies the number of Presets to use. < Expert, DFNC >	all	all	Fast
	Cycling Preset Incremental Source	cyclingPresetIncrementalSource	Specifies the source that increments the currently active cycling preset. < Expert, DFNC >	all	all	Fast
	None	*None*	*Feature cyclingPresetCurrentActiveSet is used to select the current active set.*			
	Valid Frame Trigger	*ValidFrameTrigger*	*Increment on a Valid Frame Trigger*			
	Counter 1 End	*Counter1End*	*Increment on the end of Counter 1.*			
	Start of Frame	*StartOfFrame*	*Increment on the Start of Frame event*			
	Cycling Preset Repeater	cyclingPresetRepeater	Specifies the required number of cycling preset increment events (generated by the Cycling Preset Incremental Source) to increment the index of the Cycling Preset Current Active Set. < Expert, DFNC >	all	all	Fast
	Cycling Preset Reset Source	cyclingPresetResetSource	Specifies the source that resets the currently active preset. On reset the current preset index is set to 1. < Expert, DFNC >	all	all	Fast
	Valid Frame Trigger	*ValidFrameTrigger*	*Reset when a Valid Frame Triggers occurs.*			
	Counter 1 End	*Counter1End*	*Reset when counter 1 ends.*			
	Acquisition End	*EndOfAcquisition*	*Use End of Acquisition as the reset source. An End of Acquisition occurs on acquisition stop.*			

	Software	*Software*	*Use a software command as the reset source.*			
	Cycling Preset Reset Cmd	cyclingPresetResetCmd	Reset the position of the preset cycling to 1 and the count to 0. < Guru DFNC >	all	all	Fast
	Cycling Preset Current Active Set	cyclingPresetCurrentActiveSet	Returns the index of the currently active cycling preset. < Guru DFNC >	all	all	Fast
	Features Activation Selector	cP_FeaturesActivationSelector	Selects the feature to control by the cP_FeaturesActivationMode feature. < Expert, DFNC >	all		
	Exposure Time	*ExposureTime*	*The cP_FeaturesActivationMode feature controls the exposure time.*		all	Fast
	Exposure Delay	*ExposureDelay*	*The cP_FeaturesActivationMode feature controls the exposure delay.*	all	all	all
	Gain	*Gain*	*The cP_FeaturesActivationMode feature controls the Gain.*		all	Fast
	Lookup Table	*LookUpTable*	*The cP_FeaturesActivationMode feature controls the lookup table.*		all	Fast
	Flat Field Correction	*FlatFieldCorrection*	*The cP_FeaturesActivationMode feature controls the flat field correction.*		STD 1.20 - JPG	—
	ROI Position	*ROI_Position*	*The cP_FeaturesActivationMode feature will control ROI position.*	all	all	all
	Output Lines	*OutputLineControl*	*The cP_FeaturesActivationMode feature controls the output lines.*		all	Fast
	Black Level	*BlackLevel*	*The cP_FeaturesActivationMode feature controls the black level.*		all	—
	Features Activation Mode	cP_FeaturesActivationMode	Enables the selected feature to be part of the cycling. When activating the selected feature, this will automatically set the corresponding standard camera feature to read only. < Expert, DFNC >	all	all	all
	Off	*Off*	*Exclude the selected feature from the cycling.*			
	Active	*Active*	*Activate the selected feature in the cycling.*			
	Preset Configuration Selector	cP_PresetConfigurationSelector	Selects the cycling preset to configure. < Expert, DFNC >	all	all	all
	Exposure Time	cP_ExposureTime	Sets the exposure time (in microseconds) for the selected set. The maximum frame rate is dependent on the longest cycling exposure time. < Expert, DFNC >	all	all	all
	Exposure Delay	cP_ExposureDelay	Sets the exposure delay (in microseconds) for the selected set. < Expert, DFNC >	all	all	all
	Gain Selector	cP_GainSelector	Selects which gain is controlled when adjusting cp_Gain features. < Expert, DFNC >	all	all	all
	Analog	*AnalogAll*	*Apply an analog gain adjustment within the sensor to the entire image.*			

	Digital	*DigitalAll*	*Apply a digital gain adjustment to the entire image.*			
	Gain	cP_Gain	Sets the selected gain as an amplification factor applied to the image. This gain is applied when the current Cycling index is active. < Expert, DFNC >	all	all	all
	Black Level Selector	cP_BlackLevelSelector	Selects which Black Level to adjust using the Black Level features. < Expert, DFNC >	all	all	—
	Analog	*AnalogAll*	*Sensor Dark Offset*			
	Black Level	cP_BlackLevel	Controls the black level as an absolute physical value. This represents a DC offset applied to the video signal, in DN (digital number) units. The Black Level Selector feature specifies the channel to adjust. < Expert, DFNC >	all	all	—
	LUT Mode	cP_LUTMode	Enables the current lookup table (LUT). This is only used when the currently selected cycling preset is active. < Expert, DFNC >	all	all	all
	Off	*Off*	*Look up tables (LUTs) are not used.*			
	Active	*Active*	*Look up tables (LUTs) are enabled.*			
	LUT Current Active Set	cP_LUTCurrentActiveSet	Sets the current lookup table (LUT) to use. This feature is only used when the currently selected cycling preset is active. < Expert, DFNC >	all	all	all
■□	*Luminance 1*	*Luminance1*	*Sets the current LUT as Luminance 1.*			
■□	*Luminance 2*	*Luminance2*	*Sets the current LUT as Luminance 2.*			
■□	*Luminance 3*	*Luminance3*	*Sets the current LUT as Luminance 3.*			
■□	*Luminance 4*	*Luminance4*	*Sets the current LUT as Luminance 4.*			
	Flat Field Correction Mode	cP_FlatfieldCorrectionMode	Sets the mode for the Flat Field correction. < Expert, DFNC >	all	1.20 – STD 1.20 - JPG	—
	Off	*Off*	*Flat Field Correction is disabled.*			
	Active	*Active*	*Flat Field Correction is enabled.*			
	Flat Field Correction Current Active Set	cP_FlatfieldCorrectionCurrentActiveSet	Specifies the current set of Flat Field coefficients to use. < Expert, DFNC >	all	1.20 – STD 1.20 - JPG	—
	Factory Flatfield	*FactoryFlatfield*	*Sets the factory Flat Field coefficient table as the current Flat Field.*			
	User Flatfield 1	*UserFlatfield1*	*Sets User Flat Field 1 coefficient table as the current Flat Field.*			
	User Flatfield 2	*UserFlatfield2*	*Sets User Flat Field 2 coefficient table as the current Flat Field.*			
	User Flatfield 3	*UserFlatfield3*	*Sets User Flat Field 3 coefficient table as the current Flat Field.*			
	User Flatfield 4	*UserFlatfield4*	*Sets User Flat Field 4 coefficient table as the current Flat Field.*			

	Line Selector	cP_LineSelector	Selects which physical line (or pin) of the external device connector to configure. < Expert, DFNC >	all	all	all
	Line 5 *Line 6* *Line 7* *Line 8*	*Line5* *Line6* *Line7* *Line8*	*Index of the physical line and associated I/O control block to use.*			
	Output Line Source	cP_OutputLineSource	Selects which internal signal, or event driven pulse, or software control state to output on the selected output line. < Expert, DFNC >	all	all	all
	Off	*Off*	*Line output is Open – no output source selected.*			
	Software Controlled	*SoftwareControlled*	*The cp_OutputLineValue feature changes the state of the output.*			
	Pulse On: Start of Frame	*PulseOnStartofFrame*	*Generate a pulse on the start of the Frame Active event.*			
	Pulse On: Start of Exposure	*PulseOnStartofExposure*	*Generate a pulse on the ExposureStart event. This is typically used to trigger a strobe light.*			
	Pulse On: End of Exposure	*PulseOnEndofExposure*	*Generate a pulse on the ExposureEnd event.*			
	Pulse On: Start of Readout	*PulseOnStartofReadout*	*Generate a pulse on the ReadoutStart event.*			
	Pulse On: End of Readout	*PulseOnEndofReadout*	*Generate a pulse on the ReadoutEnd event.*			
	Pulse On: Valid Frame Trigger	*PulseOnValidFrameTrigger*	*Generate a pulse on the FrameTrigger event.*			
	Pulse On: Invalid Frame Trigger	*PulseOnInvalidFrameTrigger*	*Generate a pulse on the Invalid FrameTrigger event.*			
	Pulse On: Start of Acquisition	*PulseOnStartofAcquisition*	*Generate a pulse when the AcquisiontStart event occurs.*			
	Pulse On: End of Acquisition	*PulseOnEndofAcquisition*	*Generate a pulse when the AcquisiontStop event occurs.*			
	Pulse On: End of Timer 1	*PulseOnEndofTimer1*	*Generate a pulse on the TimerEnd 1 event.*			
	Pulse On: End of Counter 1	*PulseOnEndofCounter1*	*Generate a pulse on the CounterEnd 1 event.*			
	Pulse On: Input 1 Event	*PulseOnInput1*	*Generate a pulse on the Input signal 1 event.*			
	Pulse On: Input 2 Event	*PulseOnInput2*	*Generate a pulse on the Input signal 2 event.*			
	Pulse On: Input 3 Event	*PulseOnInput3*	*Generate a pulse on the Input signal 3 event.*			
	Pulse On: Input 4 Event	*PulseOnInput4*	*Generate a pulse on the Input signal 4 event.*			
	Pulse On: Software Cmd	*PulseOnSoftwareCmd*	*Generate a pulse on the Input of a Software Command.*			
	Output Line Value	cP_OutputLineValue	Sets the output state of the selected Line if the outputLineSoftwareLatchControl = OFF. OutputLineSource must be SoftwareControlled. If the outputLineSoftwareLatchControl=Latch, the state of the pin will change with the outputLineSoftwareCmd command. < Expert, DFNC >	all	all	all
	Active	*Active*	*Sets the Output circuit to closed.*			
	Inactive	*Inactive*	*Sets the Output circuit to open.*			
	Horizontal Offset	cP_OffsetX	Horizontal offset from the origin to the region of interest (ROI). The value in this feature is only used when the currently selected cycling preset is active. < Expert, DFNC >	all	all	all

	Vertical Offset	cP_OffsetY	Vertical offset from the origin to the region of interest (ROI). The value in this feature is only used when the currently selected cycling preset is active. < Expert, DFNC >	all	all	all
	Black Level RAW	cP_BlackLevelRaw	Controls the black level as an absolute physical value. < Invisible, DFNC >	all	all	—

Using Cycling Presets—an Example

As presented in this category's overview, the cycling preset features allows setting up camera configurations that can change dynamically and repeatedly, with a minimum overhead. The features that change along with the trigger for the feature change are preprogrammed in the camera. Additionally a set of preset features can be updated while the camera is acquiring with a different preset. Such dynamic feature changes allow applications to perform tracking algorithms.

The following example describes a simple cycling sequence of exposure and gain change steps which will repeat until stopped by the user. This example uses the Sapera tool CamExpert to set features and test the sequence.

Initial Example Setup

- For this example, first configure a free running acquisition of 4 fps with an exposure time that's somewhat short (dark). These controls are in the Sensor Control Category group within CamExpert.
- Now select the Cycling Preset Category to setup and test the following example.
- Set *cyclingPresetMode* to *Active*. This feature enables the Cycling Preset Module.
- Set *cyclingPresetCount* to the number of presets which will be configured and used. For this example set this to 4.
- Set the feature *cyclingPresetIncrementalSource* to the event which will be used to increment the cycling presets index. For this example, set this feature to *StartOfFrame* which is a logical choice in a free-running acquisition setup.
- Set the feature *cyclingPresetRepeater* to the number of incremental source events to count before switching to the next preset. In this example we are counting *StartOfFrame* events, thus a value of 4 (with a test setup of 4 fps) will switch presets every one second.
- The feature *cyclingPresetResetSource* is optional for this example. This defines the event which will reset the preset index back to 1. In this example, by setting the feature to *EndOfAcquisition* we know that when Freeze is clicked in CamExpert to stop the free-running acquisition, the cycling preset index is returned to the start (1).

Cycling Example: Changing Exposure and Gain

The following steps program four presets to create a cycling sequence, starting with preset index 1.

- Set *cP_PresetConfigurationSelector* to index 1.
- Set *cP_FeaturesActivationSelector* to *ExposureTime.*
- Set *cP_FeaturesActivationMode* to *Active*. This defines the camera exposure as one variable stored in this preset index 1.
- The feature *cP_ExposureTime* now is in dark text (active) and shows the last exposure time used by the camera if cycling was not enabled, or the exposure time of set 1 if cycling was enabled. This field now controls the camera exposure time. The primary exposure time field in the Sensor Control Category is in gray text indicating a read only field.

The next steps show how to make changes to the camera and save those changes as additional cycling preset steps.

- Set *cP_PresetConfigurationSelector* to index 2.
- Set the feature *cP_ExposureTime* to a higher value, increasing the acquisition brightness.
- Repeat for index 3 with an exposure a bit higher again.

For preset index 4, the exposure time remains as set for index 3, but Analog Gain will be added as follows.

- Set *cP_PresetConfigurationSelector* to index 4.
- Set *cP_ExposureTime* to the same value as index 3.
- Set *cP_FeaturesActivationSelector* to *Gain.*
- Set *cP_FeaturesActivationMode* to *Active*. This defines the camera Gain as a variable to also store in preset index 4.
- Set the feature *cP_GainSelector* to *AnalogAll* and *cP_Gain* to the higher value.
- Therefore preset index 4 has the same exposure time as index 3 but additionally increases the analog gain.

Test the Example

- With 3 exposure times and one gain change saved in four presets, click the CamExpert Grab button to start the cycling free-running acquisition.
- The CamExpert live display window will show a live grab of 4 fps, where each second shows a four step increase in exposure, which then returns to the first exposure cycling continuously until stopped by the user.

Cycling Example: A Short Exposure followed by a Long Exposure

A second cycling example uses an external trigger to initiate a single short exposure followed by a single long exposure. A brief outline is presented here.

As was suggested for the first cycling example, the user needs to verify the two exposure setups required (including any specific camera features settings).

- Set *cyclingPresetCount* to the number of presets required which in this example is 2.
- Set the feature *cyclingPresetIncrementalSource* to *StartOfFrame*.
- Set the feature *cyclingPresetRepeater* to 1.
- Set the feature *cyclingPresetResetSource* to *ValidFrameTrigger.*

The following steps program two presets to create a cycling sequence, starting with preset index 1.

- Set *cP_PresetConfigurationSelector* to index 1.
- Set *cP_FeaturesActivationSelector* to *ExposureTime.*
- Set *cP_FeaturesActivationMode* to *Active*. This defines the camera exposure as one variable stored in this preset index 1.
- The feature *cP_ExposureTime* now is in dark text (active) and shows the last exposure time used by the camera. This field now controls the camera exposure time.
- Set *cP_PresetConfigurationSelector* to index 2.
- Set the feature *cP_ExposureTime* to the required higher value.
- Test cycling sequence with and external trigger.

Image Format Control Category

The Genie TS Image Format controls, as shown by CamExpert, groups parameters used to configure camera pixel format, image cropping, and the binning function, Additionally a feature control to select and output a Genie TS internal test image simplifies qualifying a camera setup without a lens.

Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.

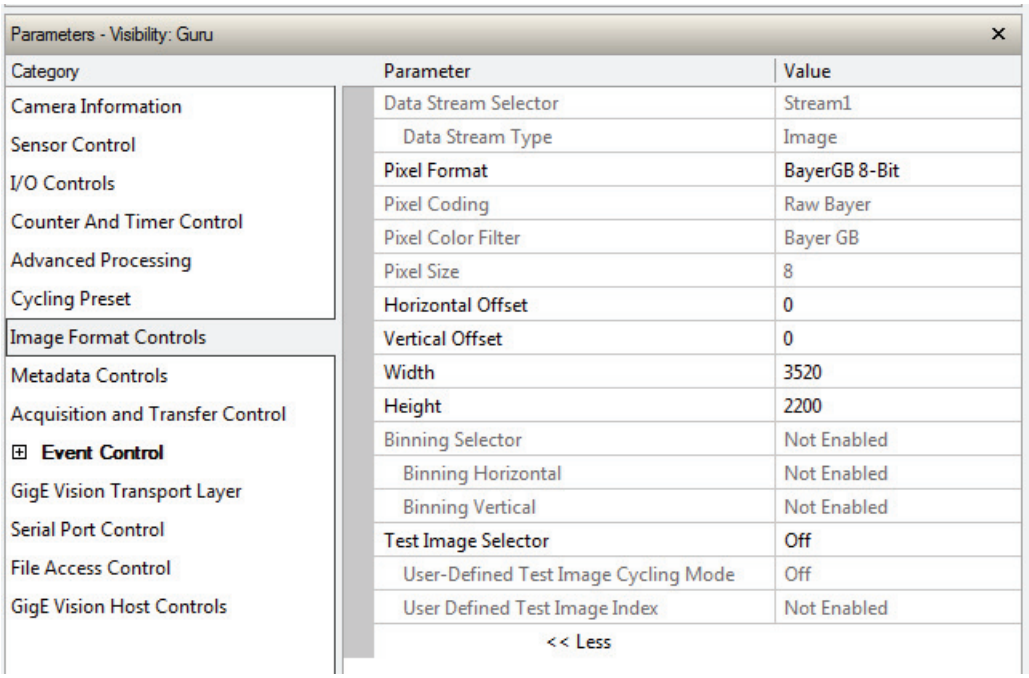


Image Format Control Feature Description

The following table describes these features along with their view attribute and device framework version. For each feature the device version may differ for each camera sensor available and whether the camera is programmed with Standard firmware (STD), JPEG firmware (JPG), or Fast firmware (FST). Such differences will be clearly indicated for any applicable feature.

When a Device Version number is indicated, this represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

The first column indicates whether a feature applies to monochrome or color camera models via a symbol. No symbol indicates a common feature. Additionally the description column will indicate which feature is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

B/W Color	Display Name	Feature & Values	Description	Vouvray DALSA	CMOSIS CMV xx	AnaFocus Lince 5M
	Data Stream Selector	dataStreamSelector	Select which data stream to control (default is Stream 1) < RO, Expert, DFNC >	All Designs	All Designs	All Designs
	Stream1	*Stream1*	*Adjust parameters for Stream1.*			
	Data Stream Type	dataStreamType	This feature is used to retrieve the transfer protocol used to stream blocks. < RO, Beginner, DFNC >	V1.00 - STD V1.20 - JPG	V1.00 - STD V1.20 - JPG	
	Image	*Image*	*The Image data blocks are streamed using the payload type "Image".*			
	Image_MetaData	*Image_MetaData*	*Image_MetaData blocks are streamed using the payload type "Extended Chunk Data with Image"*			
	JPEG	*JPEG*	*JEG image data blocks are streamed using the payload type "JPEG Data".*			
	Jpeg_MetaData	*Jpeg_MetaData*	*JEG image data blocks are streamed using the payload type "JPEG With Extended Chunk Data".*			
	MetaData	*MetaData*	*The Metadata blocks are streamed using the payload type "Chunk Data".*			
	Pixel Format	PixelFormat	Contains all format information as provided by PixelCoding, PixelSize, PixelColorFilter, combined in one single value. Decimation must be Off. < Beginner >	V1.00 - STD V1.20 - JPG	V1.00 - STD V1.20 - JPG	
	Monochrome 8-Bit	*Mono8*	*Mono8: Monochrome 8-Bit*			v1.20
	Monochrome 10-Bit	*Mono10*	*Mono10: Monochrome 10-Bit*			
	BayerGB 8-Bit	*BayerGB8*	*Color camera: BayerGB 8-Bit*			
	BayerGB 10-Bit	*BayerGB10*	*Color camera: BayerGB 10-Bit*			

	BGRa8 8-Bit	*BGRA8*	*Color camera: Blue, Green, Red, Alpha 4x8-bit pixel*	V1.20 - STD		
	BGRY8 8-Bit	*BGRY8*	*Color camera: Blue, Green, Red, Y 4x8-bit pixel*	V1.20 - STD		
	RGB10p32	*RGB10p32*	*Color camera: Red, Green, Blue, 3x10-bit packed pixel*	V1.20 - STD		
	UV422_8_UYVY	*YUV422_8_UYVY*	*Color camera: YUV422_8_UYVY*	all		
	YUV422_8_YUYV	*YUV422_8*	*Color camera: YUV422_8_YUYV*	all		
	Horizontal Offset	OffsetX	Horizontal offset from the Sensor Origin to the Area Of Interest (in pixels). < Beginner >	all	all	all
	Vertical Offset	OffsetY	Vertical offset from the Sensor Origin to the Area Of Interest (in Lines). < Beginner >	all	all	all
	Width	Width	Width of the Image provided by the device (in pixels). < Beginner >	all	all	all
	Height	Height	Height of the Image provided by the device (in lines). < Beginner >	all	all	all
	Multiple ROI Mode	multipleROIMode	Enable the Multiple ROI (Region of Interest) per image feature. The ROI Count is set by the Multiple ROI Count feature. < Expert, DFNC >		V1.20 - STD V1.20 - Fast	
	Off	*Off*	*Single ROI per image.*			
	Active	*Active*	*The ROI per image feature is active.*			
	ROI Count Horizontal	multipleROICountHorizontal	Specifies the number of ROI (Region of Interest) available for the X axis. < Expert, DFNC >			
	ROI Count Vertical	multipleROICountVertical	Specifies the number of ROI (Region of Interest) available for the Y axis. < Expert, DFNC >			
	ROI Count	multipleROICount	Specifies the number of possible ROI (Region of Interest) available in an acquired image. Two is minimum, while the maximum is device specific. < Expert, DFNC, RO >			
	ROI Selector	multipleROISelector	Select an ROI (Region of Interest) when Multiple ROI Mode is enabled. Selector range is from 1 to the Multiple ROI Count value. < Expert, DFNC >			
	ROI (x1, y1)	*roi1_1*	*ROI (x1, y1)*			
	ROI (x2, y1)	*roi2_1*	*ROI (x2, y1)*			
	ROI (x3, y1)	*roi3_1*	*ROI (x3, y1)*			
	ROI (x4, y1)	*roi4_1*	*ROI (x4, y1)*			
	ROI (x1, y2)	*roi1_2*	*ROI (x1, y2)*			
	ROI (x2, y2)	*roi2_2*	*ROI (x2, y2)*			
	ROI (x3, y2)	*roi3_2*	*ROI (x3, y2)*			

	ROI (x4, y2)	*roi4_2*	*ROI (x4, y2)*			
	ROI (x1, y3)	*roi1_3*	*ROI (x1, y3)*			
	ROI (x2, y3)	*roi2_3*	*ROI (x2, y3)*			
	ROI (x3, y3)	*roi3_3*	*ROI (x3, y3)*			
	ROI (x4, y3)	*roi4_3*	*ROI (x4, y3)*			
	ROI (x1, y4)	*roi1_4*	*ROI (x1, y4)*			
	ROI (x2, y4)	*roi1_4*	*ROI (x2, y4)*			
	ROI (x3, y4)	*roi1_4*	*ROI (x3, y4)*			
	ROI (x4, y4)	*roi1_4*	*ROI (x4, y4)*			
	ROI Offset X	multipleROIOffsetX	Horizontal offset (in pixels) from the origin to the selected ROI (Region of Interest). < Expert, DFNC >			
	ROI Offset Y	multipleROIOffsetY	Vertical offset (in pixels) from the origin to the selected ROI (Region of Interest). < Expert, DFNC >			
	ROI Width	multipleROIWidth	Width of the selected ROI (Region of Interest) provided by the device (in pixels). < Expert, DFNC >			
	ROI Height	multipleROIHeight	Height of the selected ROI (Region of Interest) provided by the device (in pixels). < Expert, DFNC >			
◧	Binning Selector	binningSelector	Select how the Horizontal and Vertical Binning is done. The Binning function can occur in the Digital domain of a device or at the actual sensor. < RO, Beginner, DFNC >	V1.00 - STD V1.20 - JPG	V1.00 - STD V1.20 - JPG	—
	In Sensor	*InSensor*	*The Binning function can be done inside the Sensor itself, which often allows binning to increase the data rate from the sensor.*			
	In Digital Domain	*InDigitalDomain*	*The Binning function can be done inside the device but with a digital processing function. Binning doesn't affect the current data rate from the sensor or camera.*			
	Binning Horizontal	BinningHorizontal	Number of horizontal photo-sensitive cells to combine together. This increases the intensity of the pixels but reduces the horizontal resolution. < Beginner >	all		
	Binning Vertical	BinningVertical	Number of vertical photo-sensitive cells to combine together. This increases the intensity of the pixels but reduces the vertical resolution of the image. < Beginner >	all		
◧	Decimation Selector	decimationSelector	Select how Horizontal and Vertical Decimation is done. The Decimation function can operate in the Digital domain of a device or directly at the sensor. < Beginner, DFNC >	—	—	V1.20
	In Sensor	*InSensor*	*The Decimation function operates directly in the Sensor, which often allows decimation to increase the field of view, thus reducing the read pixel count.*			

	Decimation Horizontal	DecimationHorizontal	Horizontal sub-sampling of the image. This reduces the horizontal resolution of the image by the specified horizontal decimation factor. For example, when set to 2, every second pixel is discarded. < Beginner >			V1.20
	Decimation Vertical	DecimationVertical	Vertical sub-sampling of the image. This reduces the vertical resolution of the image by the specified vertical decimation factor. For example, when set to 2, every second line is discarded. < Beginner >			V1.20
	Test Image Selector	TestImageSelector	Selects the type of test image generated by the camera. Feature is not available if Auto Brightness is active. < Beginner >	all	all	all
	Off	*Off*	*Image is from the camera sensor.*			
	Grey Horizontal Ramp	*GreyHorizontalRamp*	*Image is filled horizontally with an image that goes from the darkest possible value to the brightest.*			
	Grey Vertical Ramp	*GreyVerticalRamp*	*Image is filled vertically with an image that goes from the darkest possible value to the brightest.*			
	Purity	*Purity*	*Image is filled with an image that goes from the darkest possible value to the brightest by 1 Dn increment per frame.*			
	Grey Diagonal Ramp	*GreyDiagonalRamp*	*Image is filled horizontally and vertically with an image that goes from the darkest possible value to the brightest by 1 Dn increment per pixel.*			
	Color Bar	*ColorBar*	*Image is a color bar using stripes of White, Black, Red, Green, Blue, Cyan, Magenta and Yellow.*	v1.20	v1.20	
	Grey Diagonal Ramp Moving	*GreyDiagonalRampMoving*	*Image is filled horizontally with an image that goes from the darkest possible value to the brightest by 1 Dn increment per pixel and that moves horizontally.*			
	User Defined	*UserDefined*	*Image is a User defined uploaded image for each frame.*			
	User Defined Test Image Cycling Mode	testImageUserDefinedCyclingMode	Enable automatic cycling for the user defined uploaded image. < RO, Beginner >	all	all	all
	Off	*Off*	*Disabled*			
	User Defined Test Image Index	testImageUserDefinedIndex	Selects a UserDefined image loaded on the device. This feature is READ ONLY if the testImageUserDefinedCyclingMode feature is set to Active. A color user test image must be a color format supported by the color camera used. < Beginner, DFNC >	all	all	all
	User Defined Test Image 1	*UserDefinedImage1*	*Specify a UserDefineImage test pattern loaded with the file Access on the device. This feature is model dependent.*			

	Width Max	WidthMax	The maximum image width is the dimension calculated after horizontal binning, decimation or any other function changing the horizontal dimension of the image. < RO, Invisible >	all	all	all
	Height Max	HeightMax	The maximum image height is the dimension calculated after vertical binning, decimation or any other function changing the vertical dimension of the image. < RO, Invisible >	all	all	all
	Test Image User Defined Width	testImageUserDefinedWidth	*For internal usage* < Invisible, DFNC >	all	all	Fast
	Test Image User Defined Height	testImageUserDefinedHeight	*For internal usage* < Invisible, DFNC >	all	all	all
	Pixel Coding	PixelCoding	Output image pixel coding format of the sensor. < RO, Invisible	V1.00 - STD V1.20 - JPG	V1.00 - STD V1.20 - JPG	
	Mono	*Mono*	*Pixel is monochrome*			
	MonoSigned	*MonoSigned*	*Pixel is monochrome and signed*			
	MonoPacked	*MonoPacked*	*Pixel is monochrome and packed*			
	Raw Bayer	*Raw*	*Pixel is raw Bayer*			
	RGB Packed	*RGBPacked*	*Pixel is RGB packed*	STD	STD	
	BGRA Packed	*BGRAPacked*	*Pixel is BGRA 32-bit*	STD	STD	
	YUV422 Packed	*YUV422Packed*	*Pixel is YUV422 16-bit UYVY*			
	YUYV Packed	*YUYVPacked*	*Pixel is YUV422 16-bit YUYV*			
	Pixel Color Filter	PixelColorFilter	Indicates the type of color filter applied to the image. < RO, Invisible	V1.00 - STD V1.20 - JPG	V1.00 - STD V1.20 - JPG	
	None	*None*	*No filter applied on the sensor.*			
	Bayer GR	*BayerGR*	*For BayerGR, the 2x2 mosaic alignment is GR/BG.*			
	Bayer RG	*BayerRG*	*For BayerRG, the 2x2 mosaic alignment is RG/GB.*			
	Bayer GB	*BayerGB*	*For BayerGB, the 2x2 mosaic alignment is GB/RG.*			
	Bayer BG	*BayerBG*	*For BayerBG, the 2x2 mosaic alignment is BG/GR.*			
	Pixel Size	PixelSize	Total size in bits of an image pixel. < RO, Invisible	all	all	all
	8 Bits/Pixel	*Bpp8*	*Bpp8: 8 bits per pixel*			
	10 Bits/Pixel	*Bpp10*	*Bpp10: 10 bits per pixel*			
	12 Bits/Pixel	*Bpp12*	*Bpp12: 12 bits per pixel*			
	16 Bits/Pixel	*Bpp16*	*Bpp16: 16 bits per pixel*			
	24 Bits/Pixel	*Bpp24*	*Bpp24: 24 bits per pixel*			
	32 Bits/Pixel	*Bpp32*	*Bpp32: 32 bits per pixel*			

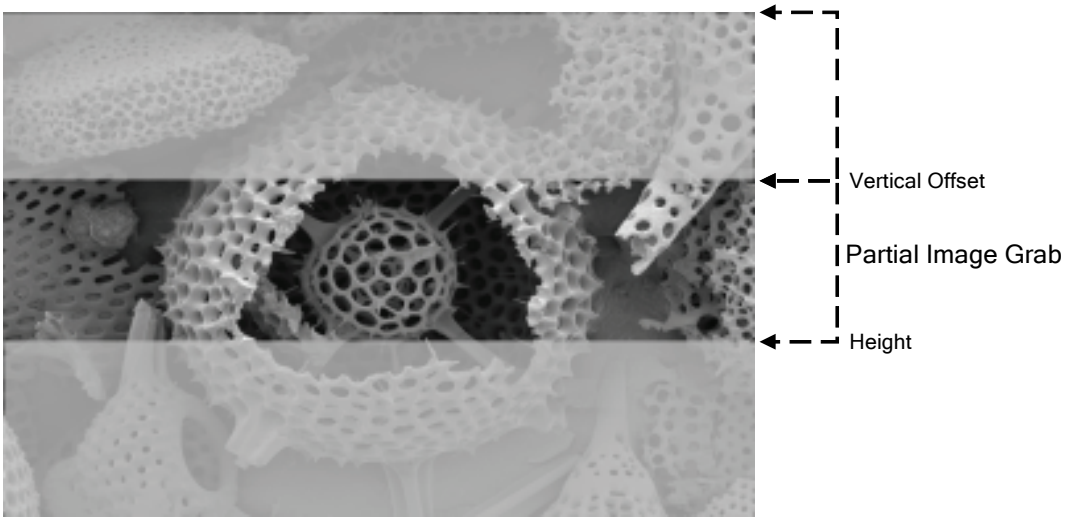
Width and Height Features for Partial Scan Control

Width and Height controls along with their respective offsets, allow the Genie TS to grab a region of interest (ROI) within the full image frame. Besides eliminating post acquisition image cropping done by software in the host computer, a windowed ROI grab reduces the bandwidth required on the Gigabit Ethernet link since less pixels are transmitted.

Vertical Cropping (Partial Scan)

The Height and Vertical Offset features, used for vertical cropping, reduce the number of video lines grabbed for a frame. By not scanning the full vertical area of the sensor, the maximum possible acquisition frame rate is proportionately increased, up to the Genie TS model maximum.

The following figure is an example of a partial scan acquisition using both Height and Vertical Offset controls. The Vertical Offset feature defines at what line number from the sensor origin to acquire the image. The Height feature defines the number of lines to acquire (to a maximum of the remaining frame height). Note that only the partial scan image (ROI) is transmitted to the host computer.



Partial Scan Illustration

Note: In general, using short exposures at high frame rates will exceed the maximum bandwidth to host transfer speed, when the camera buffer memory is filled. The tables below (for different Genie TS models) describes frame rate maximums written to internal memory, that can be sustained during continuous acquisition. Increase the exposure time, decrease the frame rate, or acquire a limited number of frames, so as to not exceed the transfer bandwidth.

Maximum Frame Rate (fps) Examples (TS-M4096 – DALSA Vouvray)

Vertical Lines Acquired	Free Running Acquisition (Synchronous Mode - 20µs exposure)	Triggered Acquisition (Reset Mode - 20µs exposure)
3072	12 fps	12 fps
2400	15 fps	15 fps
1500	25 fps	25 fps
750	50 fps	50 fps
376	100 fps	100 fps
186	199 fps	198 fps
92	385 fps	387 fps
46	719 fps	725 fps
24	1226 fps	1245 fps
10	2222 fps	2283 fps

Maximum Frame Rate (fps) Examples (TS-M3500 – DALSA Vouvray)

Vertical Lines Acquired	Free Running Acquisition (Synchronous Mode - 20µs exposure)	Triggered Acquisition (Reset Mode - 20µs exposure)
2200	19 fps	19 fps
1500	28 fps	28 fps
750	57 fps	57 fps
376	114 fps	114 fps
186	224 fps	225 fps
92	436 fps	438 fps
46	809 fps	814 fps
24	1457 fps	1426 fps
10	2433 fps	2481 fps

Maximum Frame Rate (fps) Examples (TS-M2500 – DALSA Vouvray)

Vertical Lines Acquired	Free Running Acquisition (Synchronous Mode - 20µs exposure)	Triggered Acquisition (Reset Mode - 20µs exposure)
2048	29 fps	29 fps
1500	40 fps	40 fps
750	79 fps	79 fps
376	157 fps	157 fps
186	308 fps	308 fps
92	592 fps	592 fps
46	1076 fps	1078 fps
24	1879 fps	1828 fps
10	2944 fps	3012 fps

Maximum Frame Rate (fps) Examples (TS-M2048 – CMOSIS)

Vertical Lines Acquired	Free Running Acquisition (Synchronous Mode - minimum exposure)		Triggered Acquisition (Reset Mode - minimum exposure)	
	Standard	FastMode	Standard	FastMode
2048	37.6	75.2	37.6	75.2
1592	48.5	97	48.5	97
1080	71	142	71	142
512	149	299	149	299
256	296	591	297	593
128	579	1156	583	1164
64	1111	2212	1126	2242
32	2053	4065	2105	4166
16	3558	6993	3717	7299
8	5617	10989	6024	11764
4	7936	15384	8771	16949
2	10000	19230	11363	21739

Maximum Frame Rate (fps) Examples (TS-M1920 – CMOSIS)

Vertical Lines Acquired	Free Running Acquisition (Synchronous Mode – minimum exposure)		Triggered Acquisition (Reset Mode - minimum exposure)	
	Standard	FastMode	Standard	FastMode
1080	71	142	71	142
512	149	299	149	299
256	296	591	297	593
128	579	1156	583	1164
64	1111	2212	1126	2242
32	2053	4065	2105	4166
16	3558	6993	3717	7299
8	5617	10989	6024	11764
4	7936	15384	8771	16949
2	10000	19230	11363	21739

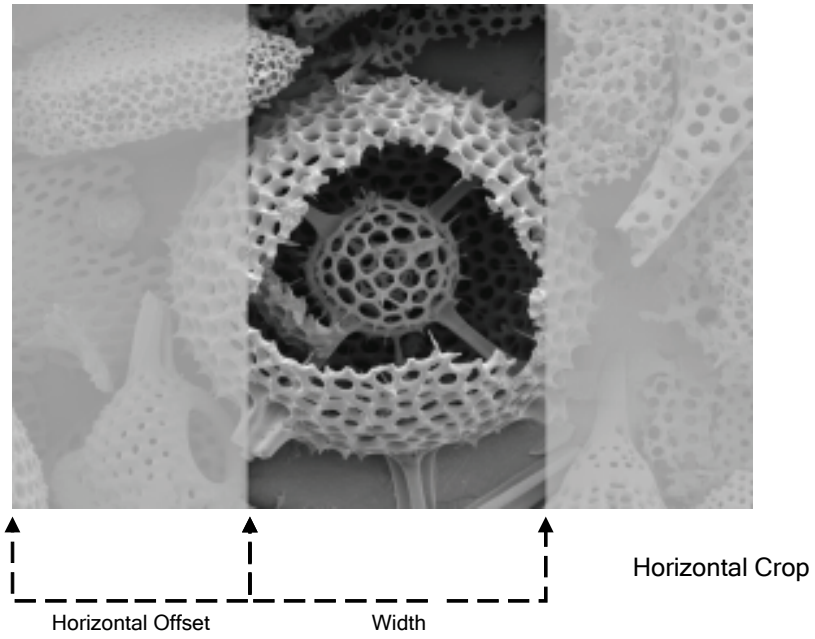
Maximum Frame Rate (fps) Examples (TS-M2560 - AnaFocus)

Vertical Lines Acquired	Free Running Acquisition (Synchronous Mode - 100µs exposure)	Triggered Acquisition (Reset Mode - 100µs exposure)
	FastMode	FastMode
2048	51.5	51.3
1536	68.4	68.2
1024	102	101.5
512	200	198
256	386	376
128	721	696
64	1272	1198
32	2058	1870
16	2978	2600
8	3849	3231
2	4907	3960

Horizontal Cropping (Partial Scan)

Genie TS supports cropping the acquisition horizontally by grabbing less pixels on each horizontal line. Horizontal offset defines the start of the acquired video line while horizontal width defines the number of pixels per line. Horizontal control features have the following independent constants:

- Horizontal Offset is limited to pixel increment values of 2 to define the start of the video line.
- Horizontal Width decrements from maximum in pixel counts of 8 (i.e. the video width is in steps of 8 pixels).

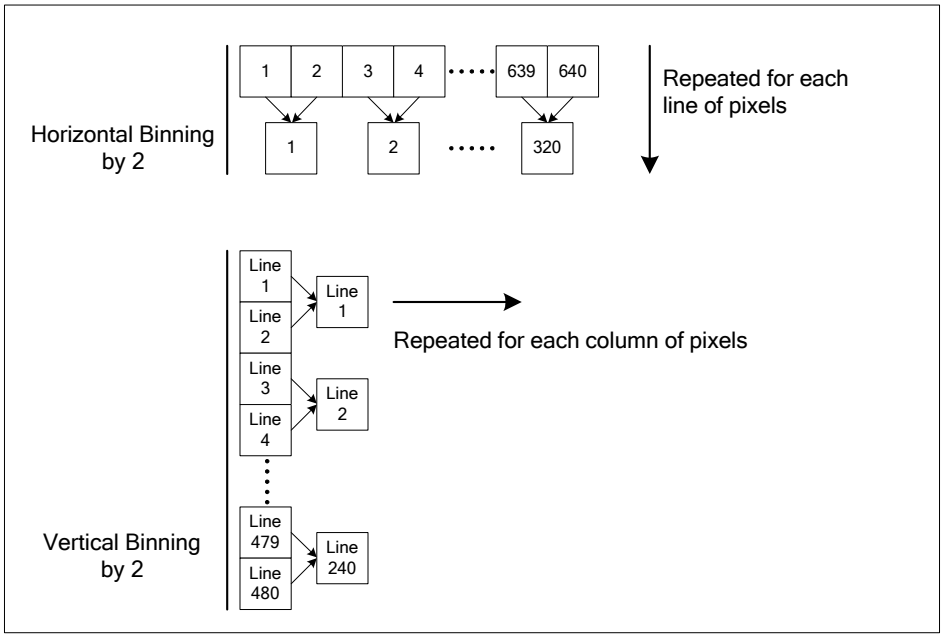


Binning

Binning is the process where the charge on two (or more) adjacent pixels is combined. This results in increased light sensitivity since there is twice the sensor area to capture photons. The sensor spatial resolution is reduced but the improved low-light sensitivity plus lower signal-noise ratio may solve a difficult imaging situation. The user can evaluate the results of the binning function on the Genie TS by using CamExpert.

Genie TS supports horizontal and vertical binning independently, by a factor of 2 or 4 in each axis. Specifically if horizontal binning only is activated, a nominal 640x480 image is reduced to 320x480. If vertical binning only is activated, the image is reduced to 640x240. With both binning modes activated, the resulting image is 320x240.

With the Genie TS, binning is performed digitally, therefore there is no increase in acquisition frame rate. The following graphic illustrates binning.



Horizontal and Vertical Binning Illustration

Horizontal Binning Constraints

- Horizontal Binning of 4 is available if the image width before binning is a multiple of 32 bytes (16 pixels in Mono10)
- Horizontal Binning of 2 is available if the image width before binning is a multiple of 16 bytes (8 pixels in Mono10)
- Horizontal Binning of 1 is always available

Vertical Binning Constraints

- Vertical Binning of 4 is available if the image height before binning is a multiple of 4 lines.
- Vertical Binning of 2 is available if the image height before binning is a multiple of 2 lines.
- Vertical Binning of 1 is always available.

Constraints with TS-M3500 (Vouvray 8M) and TS-M1920 (CMOSIS 2M) Models

These camera models, when used with the JPEG Design firmware do not support vertical binning at their full native resolution. The JPEG firmware functions on a 8x8 pixel matrix. This requires that

the video frame be **evenly** divisible by a factor of 8 (for the JPEG matrix), followed by an even division of 2 or 4 for the binning function.

- For the TS-M3500 model (Vouvray 8M) reduce the vertical resolution from 2200 lines to 2192 when using Binning=2. Reduce the vertical resolution to 2176 when using Binning=4.
- For the TS-M1920 model (CMOSIS 2M) reduce the vertical resolution from 1080 to 1072 when using Binning=2. Reduce the vertical resolution to 1056 when using Binning=4.

Internal Test Image Generator

The Genie TS camera includes a number of internal test patterns which easily confirm camera Ethernet connections or driver installations, without the need for a camera lens or proper lighting. The patterns are subject to Genie processing such as the LUT or Binning functions.

Use CamExpert to easily enable and select the any of the Genie test patterns from the drop menu while the camera is not in acquisition mode. Select live grab to see the pattern output.
The Genie test patterns are:

- **Grey Horizontal ramp**: *Image is filled horizontally with an image that goes from the darkest possible value to the brightest.*

- **Grey Vertical ramp**: *Image is filled vertically with an image that goes from the darkest possible value to the brightest.*

- **Grey Diagonal Ramp Moving**: combination of the 2 previous schemes, but first pixel in image is incremented by 1 between successive frames. This is a good pattern to indicate motion when doing a continuous grab.
  The static version of this pattern is **Grey Diagonal Ramp.**

- **Purity**: a purity pattern where all pixels have the same value. The gray value is incremented by one on successive frames to maximum then repeated. This also provides motion for live grabs.
- **User Defined**: Image is a User defined uploaded image for each frame. Such an image must match the pixel dimensions of the target camera's sensor. Additionally for color cameras the user uploaded test image must have the same raw Bayer pixel format.

Using the Multiple ROI Mode

The Multiple ROI mode (region of interest) features allow having 2 to 16 smaller image ROI areas versus the single ROI area possible with vertical and horizontal crop functions.

These multiple areas are combined as one output image, reducing transfer bandwidth requirements, plus with the added benefit that any reduction of the number of vertical lines output will result in a greater possible camera frame rate. This increased frame rate increase (written to internal memory) is similar to using the vertical crop feature.

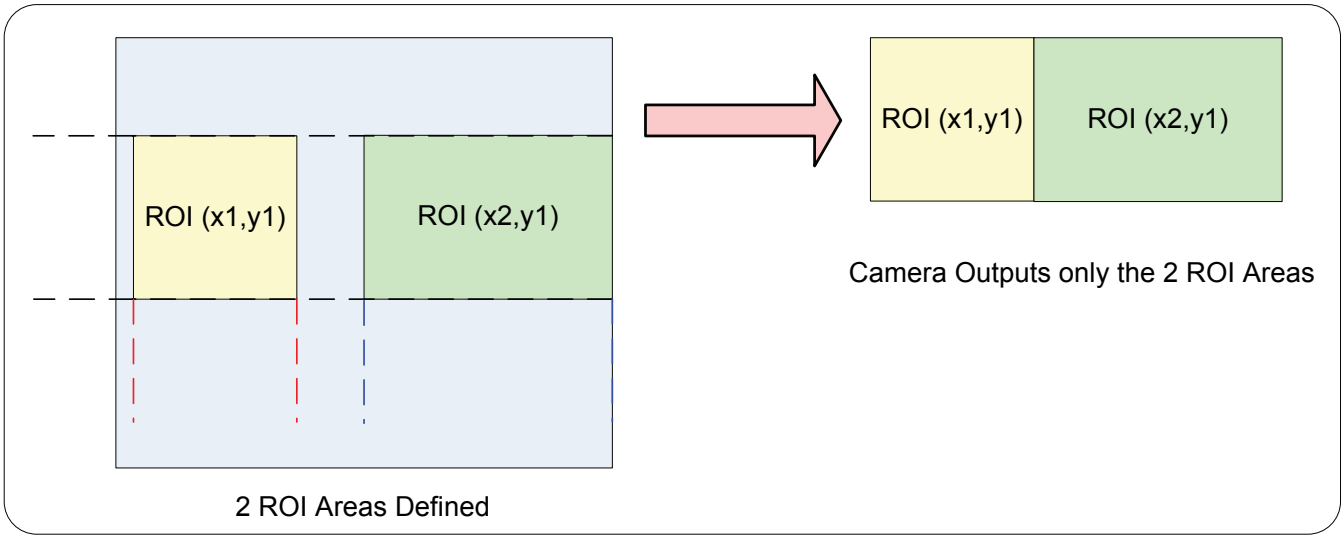
Important Usage Details

- Two to 16 ROI areas are supported by the Genie TS (4x4 matrix maximum).

- For any selected ROI, the Offset X/Offset Y features define the upper left corner of the ROI.
- Offset, Width, and Height features have individual increment values (step size) to consider.
- The first ROI of any row sets the "height value" for any other ROI in that row.
- The first ROI of any column sets the "width value" of any other ROI in that column.

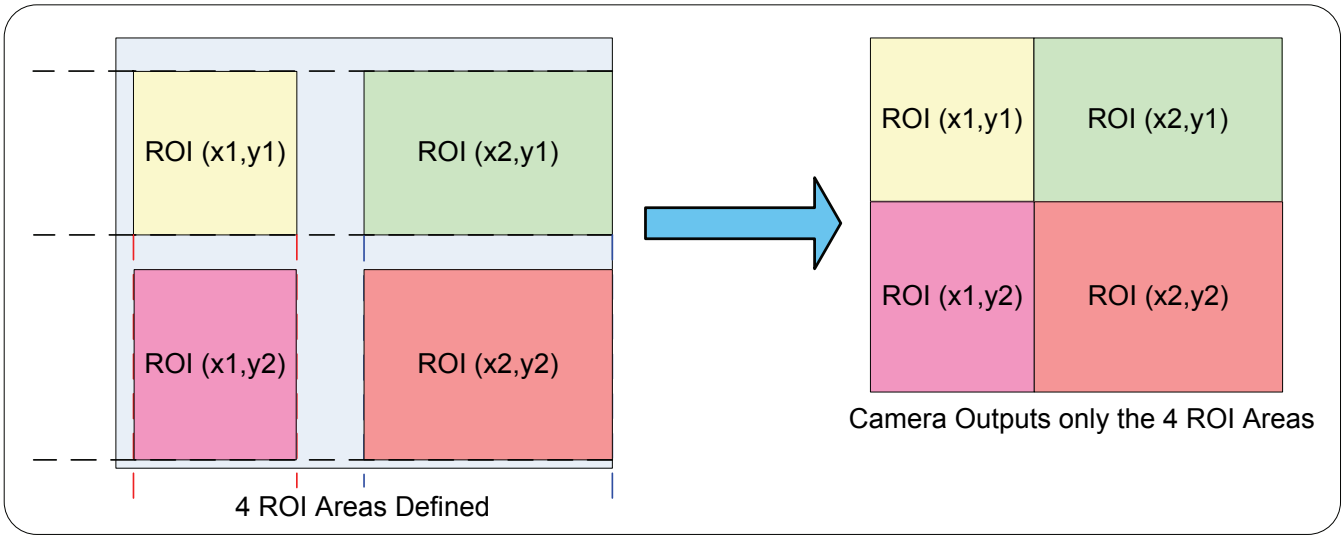
The following graphics show examples of the multi-ROI function (2x1 and 2x2 areas), the resultant camera output, and the constraints when configuring the ROI areas.

Example: Two Horizontal ROI Areas (2x1)



- Note that ROI(x1,y1) defines the height of any ROI in that row.
- ROI(x2,y1) can have a different width.
- The camera output image frame consists only of the two ROI areas. The user must account for the change between ROI data for each output image row.
- The output image being smaller, reduces the bandwidth requirements.

Example: Four ROI Areas (2x2)



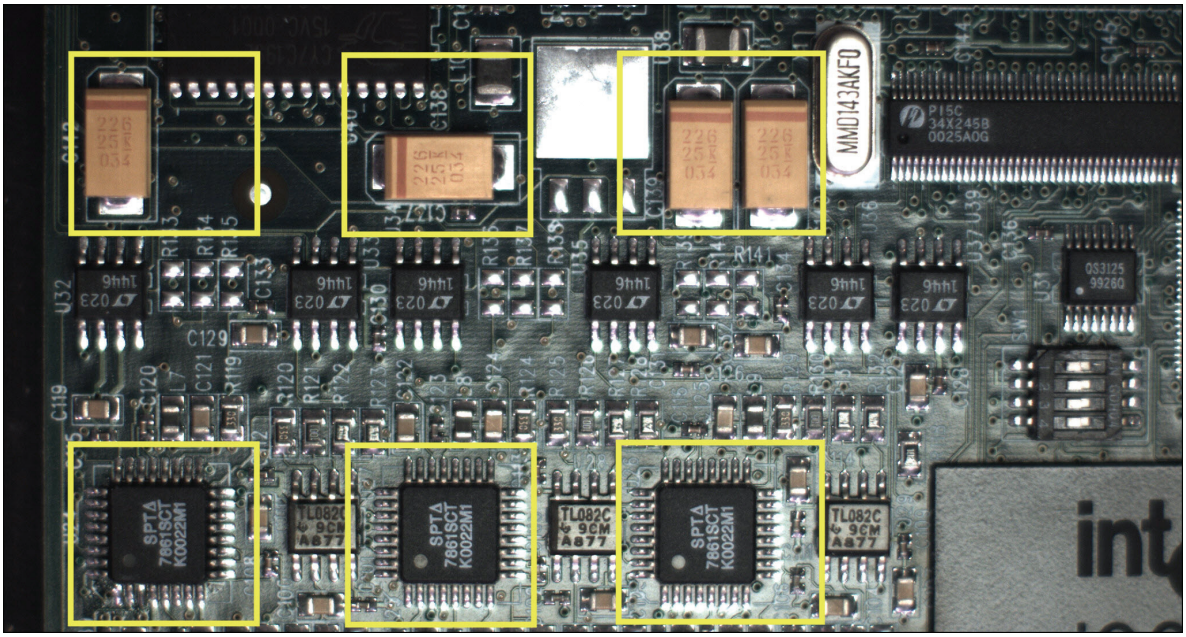
- Note that ROI(x1,y1) defines the height of any ROI in that row.

- ROI(x2,y1) can have a different width.
- ROI(x1,y2) can have a different height relative to ROI(x1,y1).
- The camera output image frame consists only of the ROI areas, in the same order as the ROI rows and columns. The user must account for the change between ROI data for each output image row.
- The output image being smaller, reduces the bandwidth requirements.

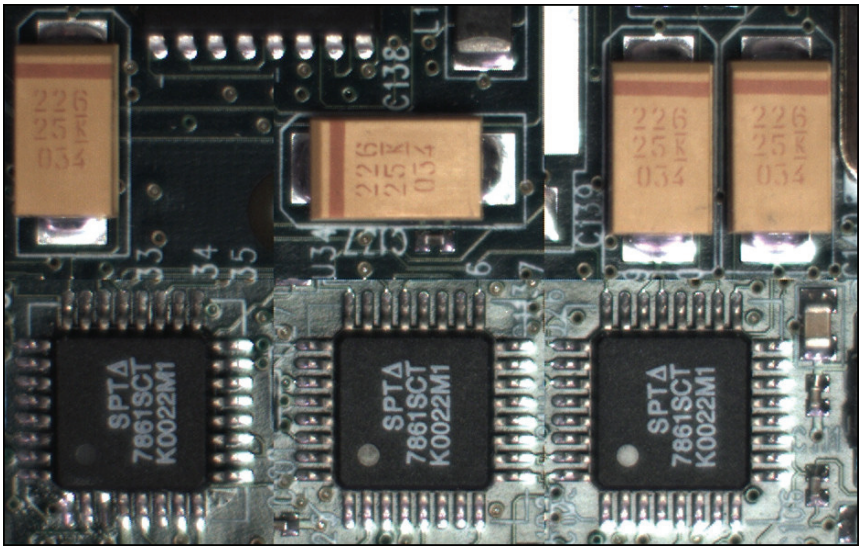
Example: Actual Sample with Six ROI Areas (3x2)

This example uses the example problem of solder inspection of certain components on a PCB. The image below of a sample PCB shows 6 ROI areas highlighted by the yellow overlay graphics (manually added to this example).

Note how the top row ROI areas may be larger than ideal due to height and width requirements of ROI areas in the second row; constraints and interdependencies as defined in the preceding ROI descriptions.



With the ROI areas defined, the camera outputs an image consisting only of data within those ROI areas, as shown below. Such data reduction improves transfer bandwidth and also reduces image processing time for the host system imaging application.

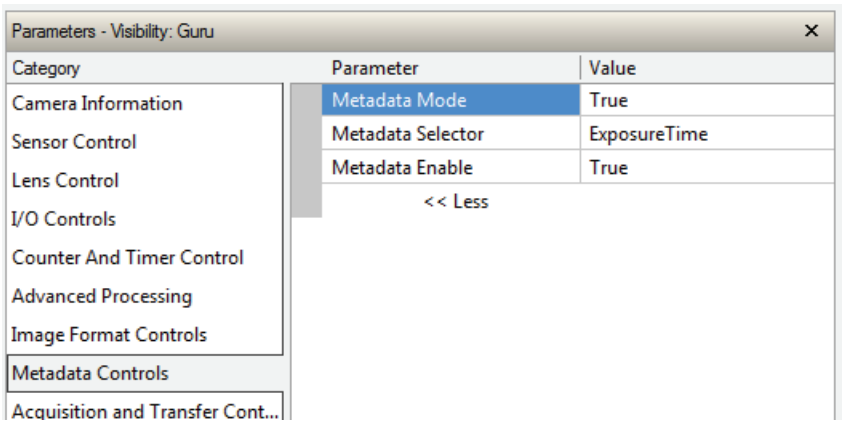


Metadata Control Category

The Genie TS Metadata controls, as shown by CamExpert, groups features to enable and select inclusion of chunk data with the image payload (as specified by the specification GigE Vision 1.2).

Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Metadata Control Category Feature Descriptions

The following table describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

Teledyne DALSA provides header files for developers managing Genie TS LUT data and chunk payload data as supported by GigE Vision 1.2. Refer to section Application Development Header Files for information about these supplied files.

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
Metadata Mode	ChunkModeActive	Activates the inclusion of chunk data (metadata) in the payload of the image.	1.00 Expert
	False	*No chunk data.*	
	True	*Chunk data included in payload*	
Metadata Selector	ChunkSelector	Selects the specific metadata to control, when enabled.	1.00 Expert
	OffsetX	*Add the OffsetX value used during the image acquisition to the metada attached to the image*	
	OffsetY	*Add the OffsetY value used during the image acquisition to the metada attached to the image.*	
	Width	*Add the Width value used during the image acquisition to the metada attached to the image.*	
	Height	*Add the Height value used during the image acquisition to the metada attached to the image.*	
	PixelFormat	*Add the PixelFormat value used during the image acquisition to the metada attached to the image.*	
	ExposureTime	*Add the ExposureTime value used during the image acquisition to the metada attached to the image.*	
	cyclingPresetCurrentActiveSet	*Add the cyclingPresetCurrentActiveSet value used during the image acquisition to the metada attached to the image.*	
	flatfieldCorrectionCurrentActiveSet	*Add the flatfieldCorrectionCurrentActiveSet value used during the image acquisition to the Metada attached to the image.*	
	LUTCurrentActiveSet	*Add the LUTCurrentActiveSet value used during the image acquisition to the metada attached to the image.*	
	Timestamp	*Add the timestampValue value used during the image acquisition to the metada attached to the image.*	
	LineStatusAll	*Add the LineStatusAll value used during the image acquisition to the metada attached to the image.*	
	FrameID	*Add the FrameID (or blockID) value to the metada attached to the image.*	
	Gain	*Add the Gain feature value used during the image acquisition to the metada attached to the image.*	
	Blacklevel	*Add the BlackLevel feature value used during the image acquisition to the metada attached to the image.*	
	DeviceID	*Add the DeviceID value to the metada attached to the image.*	
	DeviceUserID	*Add the DeviceUserID value to the metada attached to the image.*	
	irisApertureControl	*Add the irisApertureControl value used during the image acquisition to the metada attached to the image.*	
	testImageUserDefinedIndex	*Add the testImageUserDefinedIndex value used during the image acquisition to the metada attached to the image.*	
	TestImageSelector	*Add the TestImageSelector value used during the image acquisition to the metada attached to the image.*	
	BinningVertical	*Add the BinningVertical value used during the image acquisition to the metada attached to the image.*	

	BinningHorizontal	*Add the BinningHorizontal value used during the image acquisition to the metada attached to the image.*	
Metadata Enable	ChunkEnable	Sets the enable state of the selected metadata. When enabled, the metadata is included in the payload of the image.	1.00 Expert
	False	*Selected metadata Disabled*	
	True	*Selected metadata Enabled*	

Extracting Metadata Stored in a Sapera Buffer

- The image acquisition buffer size must be increased by a minimum of 256 bytes. For many cameras a buffer size increase of one video line is sufficient.
- Metadata is stored immediately following the acquired image data.
- To enable inclusion of metadata (chunk data) use the Metadata Control features described in this section.
- To extract metadata stored with each image, incorporate the supplied header files (*dalsa_genie_chunk_payload.h* and *dalsa_genie_chunk_extract.h*) within your application. See Application Development Header Files for the default installation location.
- When developing applications without using Sapera LT, request the metadata header files from Teledyne DALSA. These headers define the data structure to access the Genie TS image metadata.

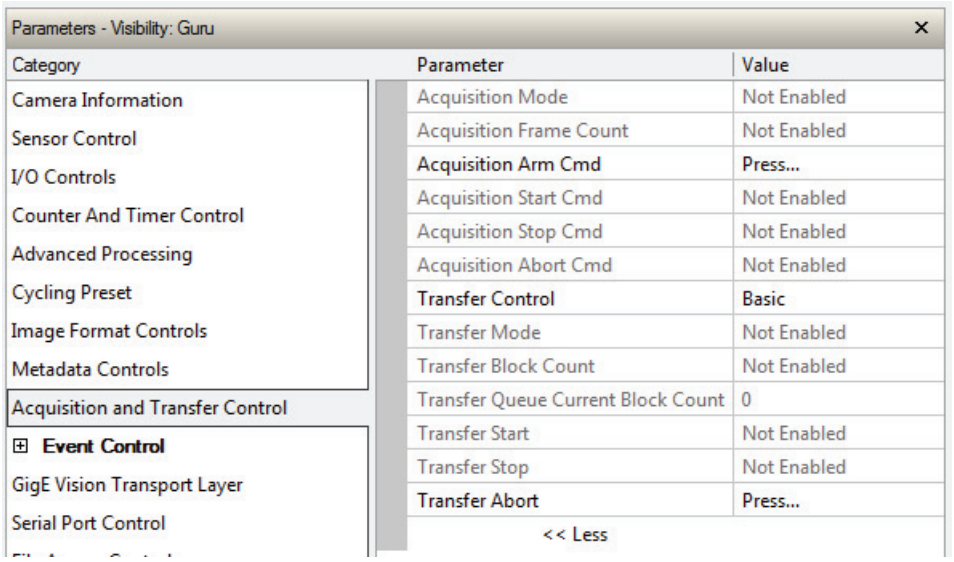
Function Description:
DALSA_GENIE_CHUNK_Extract(void *pRawChunk, UINT32 rawSize, DALSA_GENIE_CHUNK_INFO *pChunkInfo)
parameters:
pRawChunk: Pointer to the raw chunk data in the Sapera buffer
rawSize: Size of the rawChunk data in bytes (this is the max size of the buffer – set it to 256)
pChunkInfo: Caller allocated buffer that is filled with the extracted Meta Data

Acquisition and Transfer Control Category

The Genie TS Acquisition and Transfer controls, as shown by CamExpert, groups parameters used to configure the optional acquisition modes of the device. These features provide the mechanism to either have acquisitions coupled to transfers (basic mode) or to decouple acquisitions from both the camera transfer module and the host transfer module.

Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Acquisition and Transfer Control Feature Descriptions

The following table describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
Acquisition Mode	AcquisitionMode	Set the acquisition mode of the device. It defines the number of frames to capture during an acquisition and the way the acquisition stops.	1.00 Beginner
Single Frame	*SingleFrame*	*One frame is captured for each AcquisitionStart Command. An AcquisitionStop occurs at the end of the Active Frame.*	
Multi-Frame	*MultiFrame*	*A sequence of frames is captured for each AcquisitionStart Command. The number of frames is specified by AcquisitionFrameCount feature. An AcquisitionStop occurs at the end of the Active Frame(s)*	
Continuous	*Continuous*	*Frames are captured continuously with AcquisitionStart until stopped with the AcquisitionStop command.*	
Acquisition Frame Count	AcquisitionFrameCount	Number of frames to be acquired in MultiFrame acquisition mode. (Maximum number of internal frame buffers is 64k).	1.00 Beginner
Acquisition Arm Cmd	AcquisitionArm	Arms the device before an AcquisitionStart command. This optional command validates all the current features for consistency and prepares the device for a fast start of the acquisition. If not used explicitly, this command is automatically executed at the first AcquisitionStart but will not be repeated for subsequent ones unless a data transfer related feature is changed in the device. (WO)	1.00 Guru

Acquisition Start Cmd	AcquisitionStart	Start image capture using the currently selected acquisition mode. The number of frames captured is specified by AcquisitionMode feature. (WO)	1.00 Beginner
Acquisition Stop Cmd	AcquisitionStop	Stops the Acquisition of the device at the end of the current frame unless the triggerFrameCount feature is greater then 1. (WO)	1.00 Beginner
Acquisition Abort Cmd	AcquisitionAbort	Aborts the acquisition immediately. This will end the capture without completing the current Frame or aborts waiting on a trigger. If no acquisition is in progress, the command is ignored. (WO)	1.00 Beginner
Transfer Control	TransferControlMode	Sets the method used to control the transfer.	1.10 Expert
Basic	*Basic*	*Basic mode ensures maximum compatibility but does not allow for control of the transfer flow.*	
User Controlled	*UserControlled*	*Manual mode allows maximum control of the transfer flow.*	
Transfer Mode	TransferOperationMode	Sets the operation mode of the transfer.	1.10 Expert
Continuous	*Continuous*	*Blocks are transferred continuously until stopped with the TransferStop command.*	
Multi Block	*MultiBlock*	*The transfer terminates after the transition on TransferBlockCount or before on a user request.*	
Transfer Block Count	TransferBlockCount	Specifies the number of Data Blocks the device must stream during the next transfer.	1.10 Expert
Transfer Queue Current Block Count	transferQueueCurrentBlockCount	Returns the current number of blocks in the transfer queue.	1.10 Expert
Transfer Start	TransferStart	Starts the streaming of data Block(s)to another device.	1.10 Expert
Transfer Stop	TransferStop	Stops the streaming of data Block(s)to another device.	1.10 Expert
Transfer Abort	TransferAbort	Aborts the streaming of data Block(s)to another device.	1.10 Expert
Device Registers Streaming Start	DeviceRegistersStreamingStart	Announces the start of registers streaming without immediate checking for consistency.	1.00 Invisible
Device Registers Streaming End	DeviceRegistersStreamingEnd	Announces end of registers streaming and performs validation for registers consistency before activating them.	1.00 Invisible
Device Feature Persistence Start	DeviceFeaturePersistenceStart	Available and automatic with GenAPI 2.4. Called first before a camera configuration feature save with third party SDK if it is not GenAPI 2.4 compliant.	1.00 Invisible
Device Feature Persistence End	DeviceFeaturePersistenceEnd	Available and automatic with GenAPI 2.4. Called after a camera configuration feature save with third party SDK if it is not GenAPI 2.4 compliant.	1.00 Invisible
Register Check	DeviceRegistersCheck	Performs an explicit register set validation for consistency.	1.00 Invisible
Registers Valid	DeviceRegistersValid	States if the current register set is valid and consistent.	1.00 Invisible

Acquisition Buffering

All acquisitions are internally buffered and transferred as fast as possible to the host system. This internal buffer allows uninterrupted acquisitions no matter of any transfer delays that might occur (such as acquisition frame rates faster that the Gigabit Ethernet link or the IEEE Pause frame). Only when the internal buffer is consumed would an Image Lost Event be generated.

Note that the internal image buffer is a reserved minimum of 256MB, which is increased up to 512MB dependent on other functions not loaded or used (such as FFC gain and offset coefficients). Additionally the maximum number of individual image buffers is 64k, if such images are small enough to all fit in available memory.

Using Transfer Queue Current Block Count with CamExpert

This feature returns the number of frames buffered within the Genie TS pending transfer to the host system. Image frames are buffered in cases where the host system is temporarily busy or cases of high network traffic with other devices through the same Ethernet switch. By buffering image frames, the Genie TS will not need to drop frames when there are temporary delays to the transfer.

When using CamExpert (in Sapera 7.30 or later), right click on this field and then click on Refresh from the pop-up menu. The current frame count in the transfer buffer is displayed in the *Value* field. During live grab, if the number of frames in the transfer buffer is increasing, then there is a problem with the network or host bandwidth being exceeded. The ImageLost event occurs when all buffer space is consumed.

Start – End Command Requirements

Important: Every start command must have a corresponding end command. If not the camera can be in an unpredictable state. This pertains to *DeviceRegistersStreamingStart*, *DeviceRegistersStreamingEnd*, *DeviceFeaturePersistenceStart*, and *DeviceFeaturePersistenceEnd*.

Creating a Camera Configuration File in the Host

- When using the Teledyne DALSA Sapera SDK – the CCF is created automatically via a save.
- When using a 3rd party SDK application, if that SDK supports **GenAPI 2.4**, then the process is automatic. Simply follow the 3rd party *Save Camera* method as instructed. If the SDK is based on **GenAPI 2.3** or lower, the user must call the command DeviceFeaturePersistenceStart before using the SDK *Save Camera* method and the command DeviceFeaturePersistenceEnd at the end of the save function.

Overview of Transfer Control (*TransferControlMode*)

Genie TS acquisition transfers operate either in the basic coupled mode or in an independent decoupled user controlled mode, as described below.

TransferControlMode = *Basic*

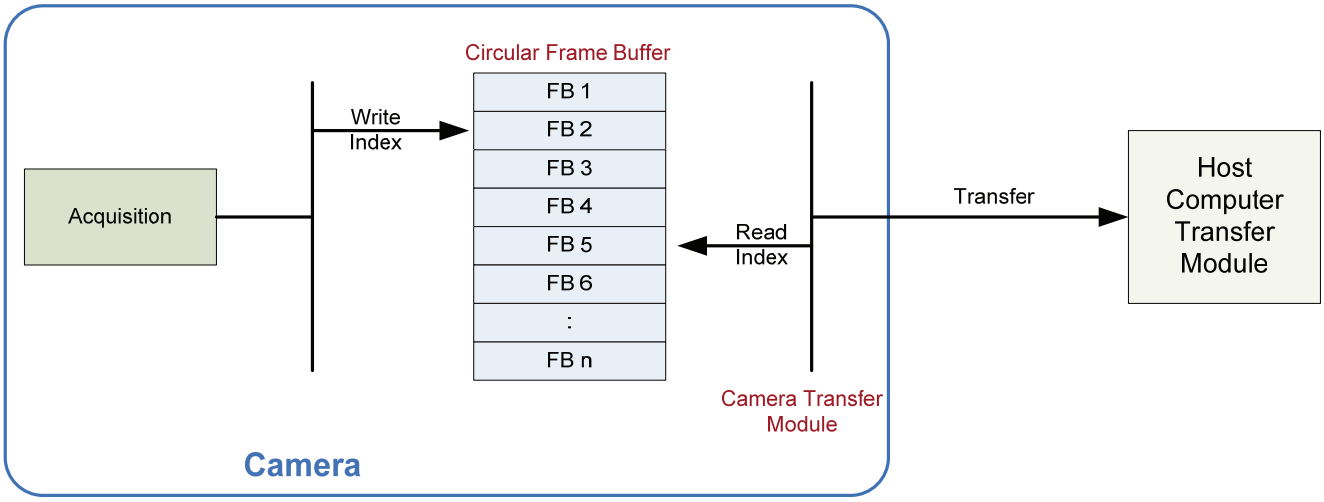
The Basic Transfer Mode provides maximum compatibility with any control application running on the host computer. In this mode, the host based acquisition program commands the camera to do a frame grab, send it through the camera's frame buffer to the camera's transfer module, where it is then received by the host. The acquisition rate is limited by the transfer rate to host.

TransferControlMode = *UserControlled*

The User Controlled Transfer Mode decouples the camera acquisition module from the camera transfer module and also from the host computer transfer module. The user has total control of each of the three control modules. Some important points are:

- The acquisition module writes frames into the camera's circular frame buffer memory. Only when all buffers are written will the next acquisition overwrite a previously stored image (this also generates the ImageLost event).
- The camera transfer module is independent of the acquisition. This allows the acquisition to not be interrupted by any network delays or traffic on the connection with the controlling host computer.
- The host computer also has independent control of the host transfer module which allows the host application to optimize receiving image packets along with other tasks running on the host.

- Important: Under user controlled transfers, the feature *TransferOperationMode* sets the transfer as either Continuous or a specific image frame count (MultiBlock). The transfer frame count is set by the feature *TransferBlockCount*, which must be equal or less than the number of image frames available in the camera's circular frame buffer (else the command is rejected). The feature *transferQueueCurrentBlockCount* is used to read the available buffer count before starting a block count transfer.



Features that Cannot be Changed During a Sapera Transfer

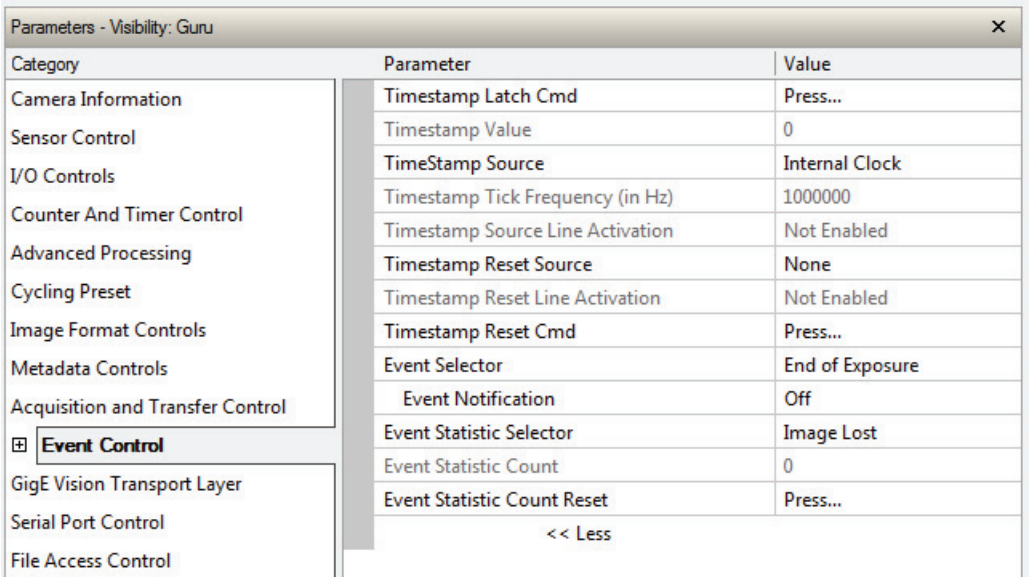
The following features cannot be changed during an acquisition or when a Sapera transfer is connected.

Feature Group	Features Locked During a Sapera Transfer
CAMERA INFORMATION	UserSetLoad
SENSOR CONTROL	*NA*
I/O CONTROL	*NA*
COUNTER AND TIMER CONTROL	*NA*
ADVANCED PROCESSING CONTROL	flatfieldCorrectionMode
CYCLING PRESET MODE CONTROL	cyclingPresetMode cP_FeaturesActivationMode cP_FlatfieldCorrectionMode
IMAGE FORMAT CONTROL	PixelFormat OffsetX OffsetY Width Height BinningHorizontal BinningVertical
METADATA CONTROL	*NA*
ACQUISITION AND TRANSFER CONTROL	DeviceRegistersStreamingStart DeviceRegistersStreamingEnd
EVENT CONTROL	*NA*
GIGE VISION TRANSPORT LAYER CONTROL	GevSCPSPacketSize
SERIAL PORT CONTROL	*NA*
GIGE VISION HOST CONTROL	InterPacketTimeout InterPacketTimeoutRaw ImageTimeout
FILE ACCESS CONTROL	*NA*

Event Control Category

The Genie TS Event control, as shown by CamExpert, groups parameters used to configure Camera Event related features. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Event Control Feature Descriptions

The following table describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

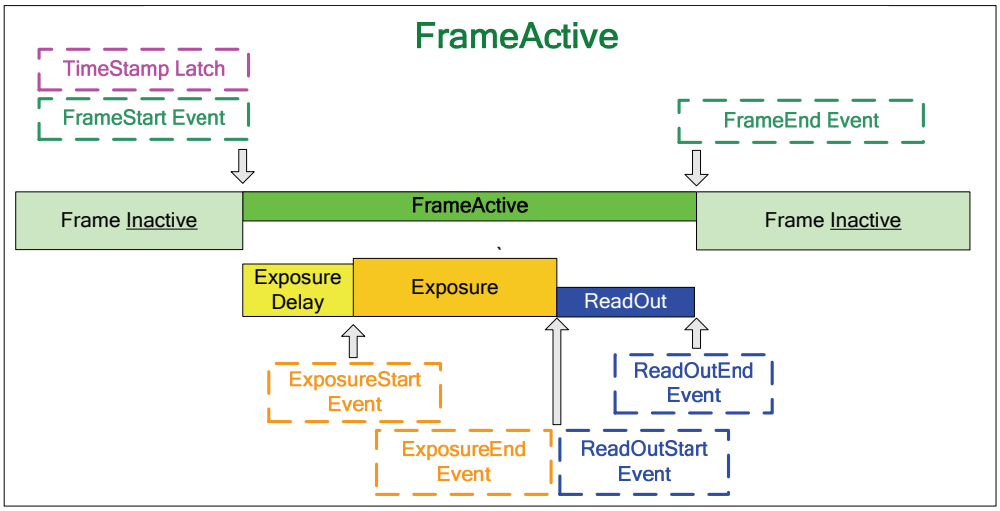
Display Name	Feature & Values	Description	Device Version & View
Timestamp Latch Cmd	timestampControlLatch	Latch the current timestamp counter as the timestamp value. (WO)	1.00 Expert DFNC
Timestamp Value	timestampValue	Returns the 64-bit value of the timestamp counter. (RO)	1.00 Expert DFNC
TimeStamp Source	timestampSource	Specifies the source used as the incrementing signal for the Timestamp register.	1.00 Expert DFNC
Internal Clock	*InternalClock*	*The timestamp source is generated by the camera internal clock. Refer to the timestampTickFrequency feature for the time base.*	
Line 3	*Line3*	*Use physical line 3 and associated I/O control block to use as the timestamp increment source.* *See* Input Signals Electrical Specifications.	
Line 4	*Line4*	*Use physical line 4 and associated I/O control block to use as the timestamp increment source.*	
Timestamp Tick Frequency (in Hz)	timestampTickFrequency	Indicates the number of timestamp ticks (or increments) during 1 second (frequency in Hz). (RO)	1.00 Expert DFNC
Timestamp Source Line Activation	timestampSourceLineActivation	Defines the activation mode to increment the timestamp counter on the selected line of the TimestampSource feature.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Specifies that the timestamp counter increment will occur on the rising edge of the source signal.*	
Falling Edge	*FallingEdge*	*Specifies that the timestamp counter increment will occur on the falling edge of the source signal.*	
Any Edge	*AnyEdge*	*Specifies that the timestamp counter increment will occur on the falling or rising edge of the source signal.*	
TimeStamp Latch Source	timestampLatchSource	Specifies the internal event or signal that will latch the timestamp counter into the timestamp buffer.	1.11 Expert DFNC
Frame Start	*FrameStart*	*The timestamp is latched on frame start.*	
Timestamp Reset Source	timestampResetSource	Specifies the internal signal or physical input line to use as the timestamp reset source.	1.00 Expert DFNC
None	*None*	*No timestamp reset source is specified. Note that the Timestamp reset command can still reset the counter.*	
Line 3	*Line3*	*Use input line 3 as the timestamp reset source.*	
Line 4	*Line4*	*Use input line 4 as the timestamp reset source.*	
Timestamp Reset Line Activation	timestampResetLineActivation	Specifies the activation mode to reset the timestamp counter on the selected line of the TimestampResetSource feature.	1.00 Expert DFNC
Rising Edge	*RisingEdge*	*Reset the timestamp counter on the rising edge of the source signal.*	

Falling Edge	*FallingEdge*	*Reset the timestamp counter on the falling edge of the source signal.*	
Any Edge	*AnyEdge*	*Reset the timestamp counter on the falling or rising edge of the source signal.*	
Timestamp Reset Cmd	timestampControlReset	Resets the timestamp counter to 0. (WO)	1.00 Expert DFNC
Event Selector	EventSelector	Select the Event to enable/disable with the EventNotification feature.	1.00 Expert
Start of Acquisition	*AcquisitionStart*	*Event sent on control channel on acquisition start.*	
End of Acquisition	*AcquisitionEnd*	*Event sent on control channel on acquisition end.*	
Start of Frame	*FrameStart*	*Event sent on control channel on an Active Frame. This occurs with the start of the exposure delay.*	
Start of Exposure	*ExposureStart*	*Event sent on control channel on start of exposure.*	
End of Exposure	*ExposureEnd*	*Event sent on control channel on end of exposure.*	
Start of Readout	*ReadoutStart*	*Event sent on control channel on start of sensor readout.*	
End of Readout	*ReadoutEnd*	*Event sent on control channel on end of sensor readout.*	
Acquisition Start Next Valid	*AcquisitionStartNextValid*	*Event sent on control channel when the AcquisitionStart command can be used again.*	
Valid Frame Trigger	*ValidFrameTrigger*	*Event sent on control channel when a valid frame trigger is generated.*	
Invalid Frame Trigger	*InvalidFrameTrigger*	*Event sent on control channel when a frame trigger occurs in an invalid Trigger region. Therefore the trigger is rejected and no frame acquisition occurs.*	
Image Lost	*ImageLost*	*Event sent on control channel when an image is lost due to insufficient onboard memory.*	
Events Overflow	*eventsOverflow*	*Event sent on control channel when all previous active events have been disabled because the camera cannot send them fast enough, generating in internal message overflow. Required events must be re-enabled manually.*	
Event Notification	EventNotification	Enable Events for the event type selected by the EventSelector feature.	1.00 Expert
Off	*Off*	*The selected event is disabled.*	
GigEVisionEvent	*GigEVisionEvent*	*The selected event will generate a software event.*	
Event Statistic Selector	eventStatisticSelector	Selects which Event statistic to display.	1.10 Expert DFNC
Image Lost	*ImageLost*	*Image is acquired but lost before it's been transferred.*	
Event Statistic	eventStatisticCount	Display the count of the selected Event.	1.10 Expert DFNC
Event Statistic Count Reset	eventStatisticCountReset	Reset the count of the selected Event.	1.10 Expert DFNC
Acquisition Start Event ID	EventAcquisitionStart	Represents the event ID to identify the EventAcquisitionStart software event.	1.00 Guru
Acquisition Start Event Timestamp	EventAcquisitionStartTimestamp	Timestamp of the EventAcquisitionStart event. (RO)	1.00 Guru
Acquisition End Event ID	EventAcquisitionEnd	Represents the event ID to identify the EventAcquisitionEnd software Event. (RO)	1.00 Guru
Acquisition End Event Timestamp	EventAcquisitionEndTimestamp	Timestamp of the EventAcquisitionEnd event. (RO)	1.00 Guru
Frame Start Event ID	EventFrameStart	Represents the event ID to identify the EventFrameStart software Event. (RO)	1.00 Guru
Frame Start Event Timestamp	EventFrameStartTimestamp	Timestamp of the EventFrameStart event. (RO)	1.00 Guru
Exposure Start Event ID	EventExposureStart	Represents the event ID to identify the EventExposureStart software Event. (RO)	1.00 Guru

Exposure Start Event Timestamp	EventExposureStartTimestamp	Timestamp of the EventExposureStart event. (RO)	1.00 Guru
Exposure End Event ID	EventExposureEnd	Represents the event ID to identify the EventExposureEnd software Event.	1.00 Guru
Exposure End Event Timestamp	EventExposureEndTimestamp	Timestamp of the EventExposureEnd event. (RO)	1.00 Guru
Readout Start Event ID	EventReadoutStart	Represents the event ID to identify the EventReadoutStart software Event. (RO)	1.00 Guru
Readout Start Event Timestamp	EventReadoutStartTimestamp	Timestamp of the EventReadoutStart event. (RO)	1.00 Guru
Readout End Event ID	EventReadoutEnd	Represents the event ID to identify the EventReadoutEnd software Event. (RO)	1.00 Guru
Readout End Event Timestamp	EventReadoutEndTimestamp	Timestamp of the EventReadoutEnd event. (RO)	1.00 Guru
AcquisitionStartNextValid Event ID	EventAcquisitionStartNextValid	Represents the event ID to identify the acquisition start next valid. (RO)	1.00 Guru
AcquisitionStartNextValid Event Timestamp	EventAcquisitionStartNextValid Timestamp	Timestamp of the acquisition start next valid event. (RO)	1.00 Guru
Valid Frame Trigger Event ID	EventValidFrameTrigger	Represents the event ID to identify the valid frame trigger. (RO)	1.00 Guru
Valid Frame Trigger Event Timestamp	EventValidFrameTrigger Timestamp	Timestamp of the Valid frame trigger event. (RO)	1.00 Guru
InvalidFrameTrigger Event ID	EventInvalidFrameTrigger	Represents the event ID to identify the event on invalid frame trigger. (RO)	1.00 Guru
InvalidFrameTrigger Event Timestamp	EventInvalidFrameTrigger Timestamp	Timestamp of the invalid frame trigger event. (RO)	1.00 Guru
ImageLost Event ID	EventImageLost	Represents the event ID to identify the event on image lost. (RO)	1.00 Guru
ImageLost Event Timestamp	EventImageLostTimestamp	Timestamp of the image lost event. (RO)	1.00 Guru
Events Overflow Event ID	EventeventsOverflow	Represents the event ID to identify the EventeventsOverflow software Event. (RO)	1.00 Guru
Events Overflow Event Timestamp	EventeventsOverflowTimestamp	Timestamp of the EventeventsOverflow event. (RO)	1.00 Guru
Gev Timestamp Latch	GevtimestampControlLatch	Latch the current timestamp internal counter value in the timestampValue feature. (WO)	1.00 Invisible
Gev Timestamp Value	GevtimestampValue	Returns the 64-bit value of the timestamp counter. (RO)	1.00 Invisible
Gev Timestamp Tick Frequency	GevtimestampTickFrequency	Indicates the number of timestamp ticks (or increments) during 1 second (frequency in Hz). (RO)	1.00 Invisible
Gev Timestamp Reset	GevtimestampControlReset	Resets the timestamp counter to 0. (WO)	1.00 Invisible

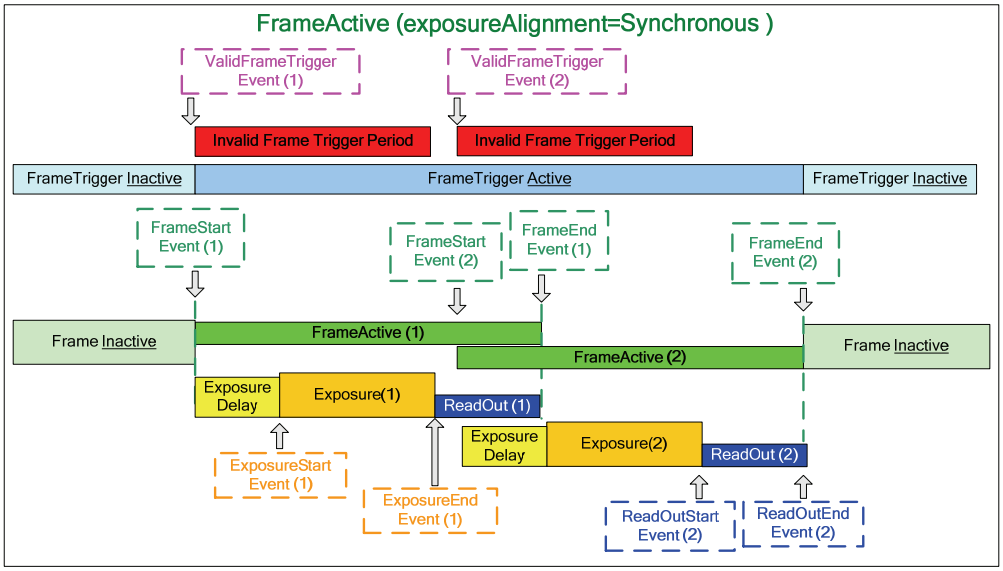
Basic Exposure Events Overview

The following timing graphic shows the primary events related to a simple acquisition.



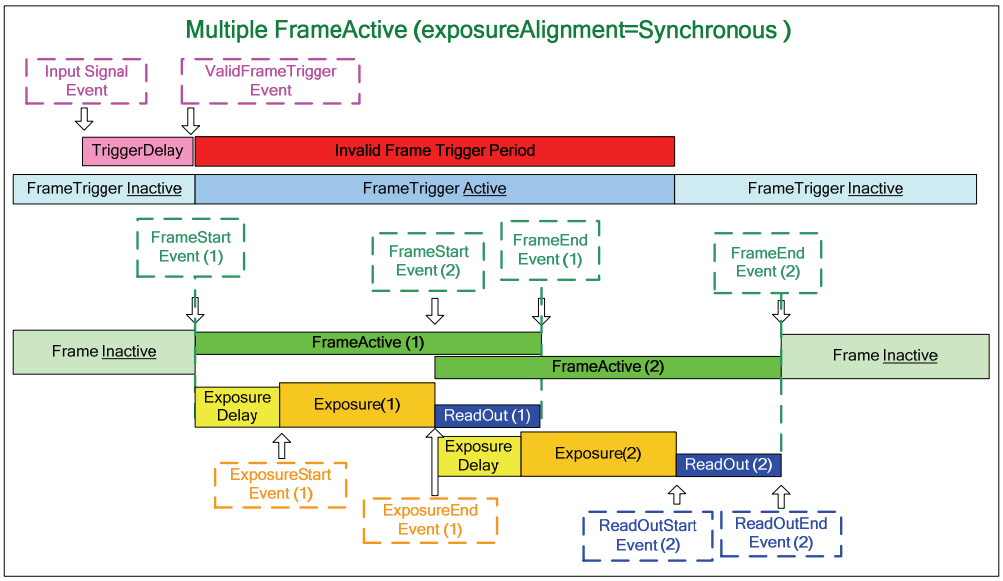
Events Associated with Triggered Synchronous Exposures

The following timing graphic shows the primary events and acquisition timing associated with a synchronous exposure of two individually triggered frames.



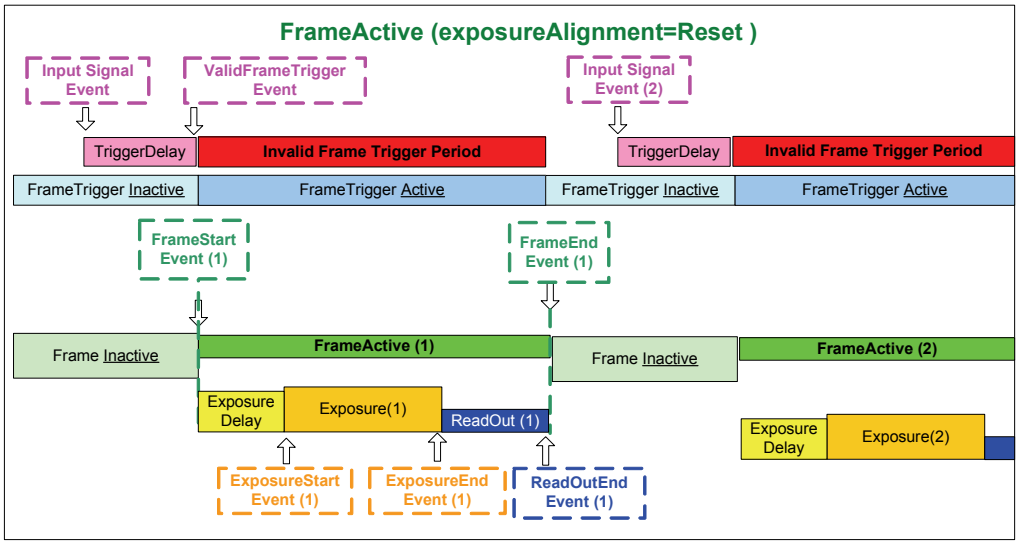
Events Associated with Triggered Multiple Frame Synchronous Exposures

The following timing graphic shows the primary events and acquisition timing associated with a synchronous exposure of two frames from a single trigger event.



Events Associated with Triggered Reset Mode Exposures

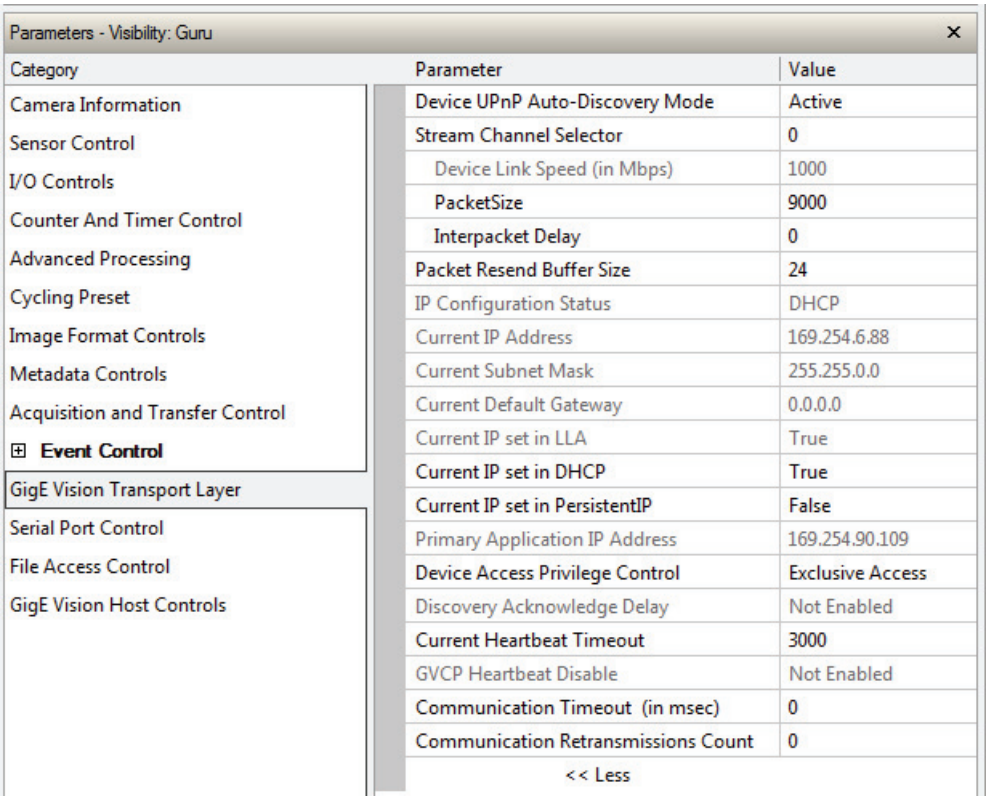
The following timing graphic shows the primary events and acquisition timing associated with reset exposure of two frames.



GigE Vision Transport Layer Control Category

The Genie TS GigE Vision Transport Layer control, as shown by CamExpert, groups parameters used to configure features related to GigE Vision specification and the Ethernet Connection. Parameters in gray are read only, either always or due to another parameter being disabled. Parameters in black are user set in CamExpert or programmable via an imaging application.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



GigE Vision Transport Layer Feature Descriptions

The following table describes these parameters along with their view attribute and minimum camera firmware version required. Additionally the Device Version column will indicate which parameter is a member of the DALSA Features Naming Convention (DFNC), versus the GenICam Standard Features Naming Convention (SFNC not shown).

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
Device UPnP Auto-Discovery Mode	deviceUPnPDiscoveryMode	Controls the operation mode for the UPnP Discovery function.	1.10 Beginner
Off	*Off*	*UPNP Device will not broadcast its existence on the network and is not visible in the Windows network neighborhood.*	
Active	*Active*	*UPNP Device will broadcast its existence on the network and is visible in the Windows network neighborhood.*	
Stream Channel Selector	GevStreamChannelSelector	Selects the stream channel to control.	1.10 Expert
Device Link Speed (in Mbps)	GevLinkSpeed	Indicates the transmission speed negotiated by the given network interface. (RO)	1.00 Expert
PacketSize	GevSCPSPacketSize	Specifies the stream packet size in bytes to send on this channel.	1.00 Expert
Interpacket Delay	GevSCPD	Indicates the delay (in µs) to insert between each packet for this stream channel.	1.00 Expert
Packet Resend Buffer Size	devicePacketResendBufferSize	Indicates the amount of memory to reserve in MBytes for the packet resend buffer	1.00 DFNC Guru
IP Configuration Status	GevIPConfigurationStatus	Reports the current IP configuration status. (RO)	1.00 Guru
None	*None*	*Device IP Configuration is not defined.*	
PersistentIP	*PersistentIP*	*Device IP Address Configuration is set to Persistent IP (static).*	
DHCP	*DHCP*	*Device IP Address Configuration is set to DHCP (Dynamic Host Configuration Protocol). Network requires a DHCP server.*	
LLA	*LLA*	*Device IP Address Configuration is set to LLA (Link-Local Address). Also known as Auto-IP. Used for unmanaged networks including direct connections from a device to a dedicated NIC.*	
ForceIP	*ForceIP*	*Device IP Address Configuration is set to ForceIP. Used to force an IP address change.*	
Current IP Address	GevCurrentIPAddress	Reports the IP address for the given network interface. (RO)	1.00 Beginner
Current Subnet Mask	GevCurrentSubnetMask	Reports the subnet mask of the given interface. (RO)	1.00 Beginner
Current Default Gateway	GevCurrentDefaultGateway	Reports the default gateway IP address to be used on the given network interface. (RO)	1.00 Beginner
Current IP set in LLA	GevCurrentIPConfigurationLLA	Controls whether the LLA (Link Local Address) IP configuration scheme is activated on the given network interface. (RO)	1.00 Guru
Current IP set in DHCP	GevCurrentIPConfigurationDHCP	Controls whether the DHCP IP configuration scheme (Dynamic Host Configuration Protocol) is activated on the given network interface.	1.00 Guru
Current IP set in PersistentIP	GevCurrentIPConfigurationPersistentIP	Controls whether the PersistentIP configuration scheme is activated on the given network interface.	1.00 Guru
Primary Application IP Address	GevPrimaryApplicationIPAddress	Returns the IP address of the device hosting the primary application. (RO)	1.00 Guru

Device Access Privilege Control	deviceCCP	Controls the device access privilege of an application.	1.00 Guru DFNC
Exclusive Access	*ExclusiveAccess*	*Grants exclusive access to the device to an application. No other application can control or monitor the device.*	
Control Access	*ControlAccess*	*Grants control access to the device to an application. No other application can control the device.*	
Discovery Acknowledge Delay	GevDiscoveryAckDelay	Indicates the maximum randomized delay the device will wait to acknowledge a discovery command. (RO)	1.00 Guru
Current Heartbeat Timeout	GevHeartbeatTimeout	Indicates the current heartbeat timeout in milliseconds.	1.00 Guru
GVCP Heartbeat Disable	GevGVCPHeartbeatDisable	Disables the GVCP (GigE Vision Control Protocol) heartbeat monitor. This allows control switchover to an application on another device.	1.00 Expert
Communication Timeout	GevMCTT	Provides the transmission timeout value in milliseconds.	1.00 Guru
Communication Retransmissions Count	GevMCRC	Indicates the number of retransmissions allowed when a message channel message times out.	1.00 Guru
Gev GVSP Extended ID Mode	GevGVSPExtendedIDMode	Enables the extended IDs mode.	1.20 Expert
Fire Test Packet	GevSCPSFireTestPacket	When this feature is set to True, the device will fire one test packet.	1.00 Invisible
Payload Size	PayloadSize	Provides the number of bytes transferred for each image or chunk on the stream channel. (RO)	1.00 Invisible
MAC Address	GevMACAddress	MAC address of the network interface. (RO)	1.00 Invisible
Current Camera IP Configuration	GevCurrentIPConfiguration	Current camera IP configuration of the selected interface. (RO)	1.00 Invisible
LLA	*LLA*	*Link-Local Address Mode*	
DHCP	*DHCP*	*Dynamic Host Configuration Protocol Mode. Network requires a DHCP server.*	
PersistentIP	*PersistentIP*	*Persistent IP Mode (static)*	
Persistent IP Address	GevPersistentIPAddress	Persistent IP address for the selected interface. This is the IP address the camera uses when booting in Persistent IP mode.	1.00 Invisible
Persistent Subnet Mask	GevPersistentSubnetMask	Persistent subnet mask for the selected interface.	1.00 Invisible
Persistent Default Gateway	GevPersistentDefaultGateway	Persistent default gateway for the selected interface.	1.00 Invisible
Stream Channel Selector	GevStreamChannelSelector	Selects the stream channel to control. (RO)	1.00 Invisible
Primary Application Socket	GevPrimaryApplicationSocket	Returns the UDP (User Datagram Protocol) source port of the primary application. (RO)	1.00 Invisible
Device Access Privilege Control	GevCCP	Controls the device access privilege of an application.	1.00 Invisible
Open Access	*OpenAccess*	*OpenAccess*	
Exclusive Access	*ExclusiveAccess*	*Grants exclusive access to the device to an application. No other application can control or monitor the device.*	
Control Access	*ControlAccess*	*Grants control access to the device to an application. No other application can control the device.*	
Interface Selector	GevInterfaceSelector	Selects which physical network interface to control.	1.00 Invisible

Number Of Interfaces	GevNumberOfInterfaces	Indicates the number of physical network interfaces supported by this device. (RO)	1.00 Invisible
Message Channel Count	GevMessageChannelCount	Indicates the number of message channels supported by this device. (RO)	1.00 Invisible
Stream Channel Count	GevStreamChannelCount	Indicates the number of stream channels supported by this device (0 to 512). (RO)	1.00 Invisible
Gev Supported Option Selector	GevSupportedOptionSelector	Selects the GEV option to interrogate for existing support. (RO)	1.00 Invisible
	IPConfigurationLLA *IPConfigurationDHCP* *IPConfigurationPersistentIP* *StreamChannelSourceSocket* *MessageChannelSourceSocket* *CommandsConcatenation* *WriteMem* *PacketResend* *Event* *EventData* *PendingAck* *Action* *PrimaryApplicationSwitchover* *ExtendedStatusCodes* *DiscoveryAckDelay* *DiscoveryAckDelayWritable* *TestData* *ManifestTable* *CCPApplicationSocket* *LinkSpeed* *HeartbeatDisable* *SerialNumber* *UserDefinedName* *StreamChannel0BigAndLittleEndian* *StreamChannel0IPReassembly* *StreamChannel0UnconditionalStreaming* *StreamChannel0ExtendedChunkData*		
Gev Supported Option	GevSupportedOption	Returns TRUE if the selected GEV option is supported. (RO)	1.00 Invisible
LLA Supported	GevSupportedIPConfigurationLLA	Indicates if LLA (Auto-IP) is supported by the selected interface. The LLA method automatically assigns the Genie with a randomly chosen address on the 169.254.xxx.xxx subnet. After an address is chosen, the link-local process sends an ARP query with that IP onto the network to see if it is already in use. If there is no response, the IP is assigned to the device, otherwise another IP is selected, and the ARP is repeated. Note that LLA is unable to forward packets across routers. LLA is the recommended scheme when only one NIC is connected to GigE cameras; ensure only one NIC is using LLA on your PC, otherwise IP conflicts will result. (RO)	1.00 Invisible
DHCP Supported	GevSupportedIPConfigurationDHCP	Indicates if DHCP is supported by the selected interface. This IP configuration mode requires a DHCP server to allocate an IP address dynamically over the range of some defined subnet. The Genie must be configured to have DHCP enabled. This is the factory default settings. The DHCP server is part of a managed network. Windows itself does not provide a DHCP server function therefore a dedicated DHCP server is required. The DALSA Network Configuration Tool can be configured as a DHCP server on the NIC used for the GigE Vision network. (RO)	1.00 Invisible

Persistent IP Supported	GevSupportedIPConfigurationPersistentIP	Indicates if Persistent IP is supported by the selected interface. This protocol is only suggested if the user fully controls the assignment of IP addresses on the network and a GigE Vision camera is connected beyond routers. The GigE Vision camera is forced a static IP address. The NIC IP address must use the same subnet otherwise the camera is not accessible. If the Genie camera is connected to a network with a different subnet, it cannot be accessed. (RO)	1.00 Invisible
GVCP Extended Status Codes	GevGVCPExtendedStatusCodes	Enables generation of extended status codes. (RO)	1.00 Invisible
Gev MCP HostPort	GevMCPHostPort	Indicates the port to which the device must send messages. (RO)	1.00 Invisible
Gev MCDA	GevMCDA	Indicates the destination IP address for the message channel. (RO)	1.00 Invisible
Gev MCSP	GevMCSP	This feature indicates the source port for the message channel. (RO)	1.00 Invisible
Stream Channel Interface Index	GevSCPInterfaceIndex	Index of network interface. (RO)	1.00 Invisible
Gev SCP HostPort	GevSCPHostPort	Indicates the port to which the device must send the data stream. (RO)	1.00 Invisible
Gev SCDA	GevSCDA	Indicates the destination IP address for this stream channel. (RO)	1.00 Invisible
Gev SCSP	GevSCSP	Indicates the source port of the stream channel. (RO)	1.00 Invisible
Gev First URL	GevFirstURL	Indicates the first URL to the XML device description file. (RO)	1.00 Invisible
Gev Second URL	GevSecondURL	Indicates the second URL to the XML device description file. (RO)	1.00 Invisible
Gev Major Version	GevVersionMajor	Major version of the specification. (RO)	1.00 Invisible
Gev Minor Version	GevVersionMinor	Minor version of the specification. (RO)	1.00 Invisible
Manifest Entry Selector	DeviceManifestEntrySelector	Selects the manifest entry to reference.	1.00 Invisible
XML Major Version	DeviceManifestXMLMajorVersion	Indicates the major version number of the XML file of the selected manifest entry. (RO)	1.00 Invisible
XML Minor Version	DeviceManifestXMLMinorVersion	Indicates the Minor version number of the XML file of the selected manifest entry. (RO)	1.00 Invisible
XML SubMinor Version	DeviceManifestXMLSubMinorVersion	Indicates the SubMinor version number of the XML file of the selected manifest entry. (RO)	1.00 Invisible
Schema Major Version	DeviceManifestSchemaMajorVersion	Indicates the major version number of the Schema file of the selected manifest entry. (RO)	1.00 Invisible
Schema Minor Version	DeviceManifestSchemaMinorVersion	Indicates the minor version number of the Schema file of the selected manifest entry. (RO)	1.00 Invisible
Manifest Primary URL	DeviceManifestPrimaryURL	Indicates the first URL to the XML device description file of the selected manifest entry. (RO)	1.00 Invisible
Manifest Secondary URL	DeviceManifestSecondaryURL	Indicates the second URL to the XML device description file of the selected manifest entry. (RO)	1.00 Invisible
Device Mode Is Big Endian	GevDeviceModeIsBigEndian	Endianess of the device registers. (RO)	1.00 Invisible
Device Mode CharacterSet	GevDeviceModeCharacterSet	Character set used by all the strings of the bootstrap registers. (RO)	1.00 Invisible
	reserved1 *UTF8* *reserved2*		

GevSCPSDoNotFragment	GevSCPSDoNotFragment	This feature state is copied into the "do not fragment" bit of IP header of each stream packet. (RO)	1.00 Invisible
Gev SCPS BigEndian	GevSCPSBigEndian	Endianess of multi-byte pixel data for this stream. (RO)	1.00 Invisible
TLParamsLocked	TLParamsLocked	Flag to indicate if features are locked during acquisition.	1.00 Invisible

Defaults for devicePacketResendBufferSize

The default minimum for devicePacketResendBufferSize allows at least one maximum sized buffer + chunk data in memory.

The formula is:

- packetResendBufferSizeMax = (Backend Frame Buffer Memory) – ((SensorWidth * SensorHeight * pixelSize) + maxChunkDataSize).

The value allowed to change dynamically is pixelSize. The values SensorWidth and SensorHeight are used because the Width and Height values can change if binning is used or even while grabbing.

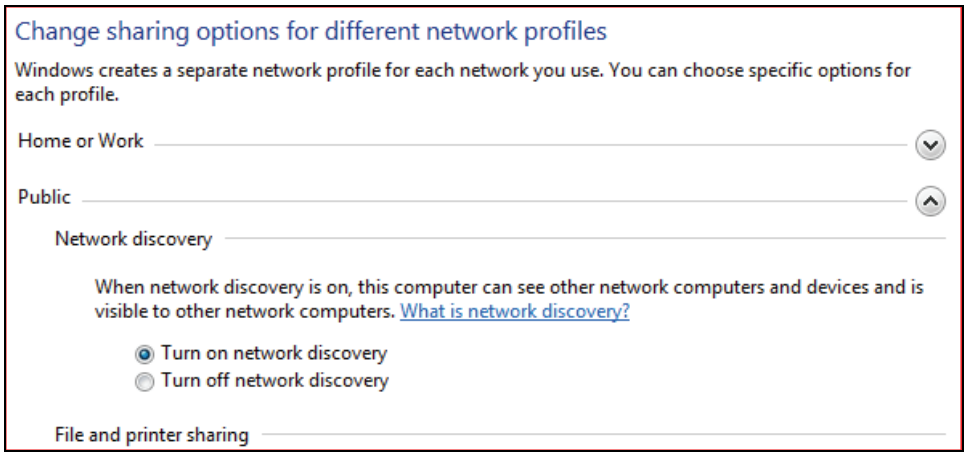
Device UPnP Auto-Discovery Mode Details

The Genie TS supports UPnP Network Auto-Discovery (*Universal Plug and Play*), thus allowing other devices on the network to find and access the Genie TS without the Genie TS Framework installed. This section describes the Windows configuration required for UPnP Auto-Discovery, accessing the Genie TS web page and file access to user accessible memory on the camera.

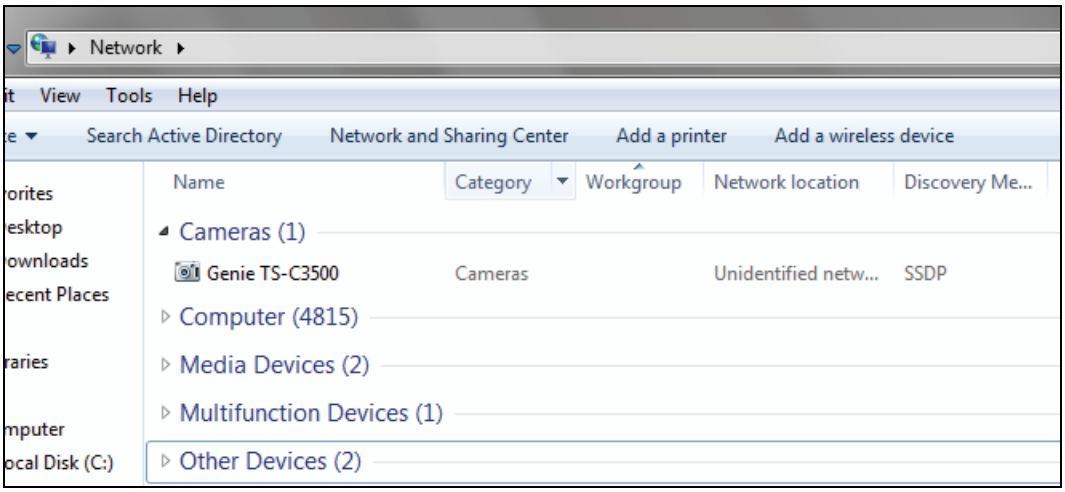
Enable Windows Network Discovery

These instructions apply to Windows 7:

- Go to **Control Panel\All Control Panel Items\Network and Sharing Center\Advanced sharing settings**.
- Windows shows a menu to configure options for each network profile available on that computer.
- Most systems used with the Genie TS will have a second NIC for the camera, therefore the **Public** profile needs to be configured. Expand the options view for **Public**.
- Enable Network Discovery if it is off, then save your change.

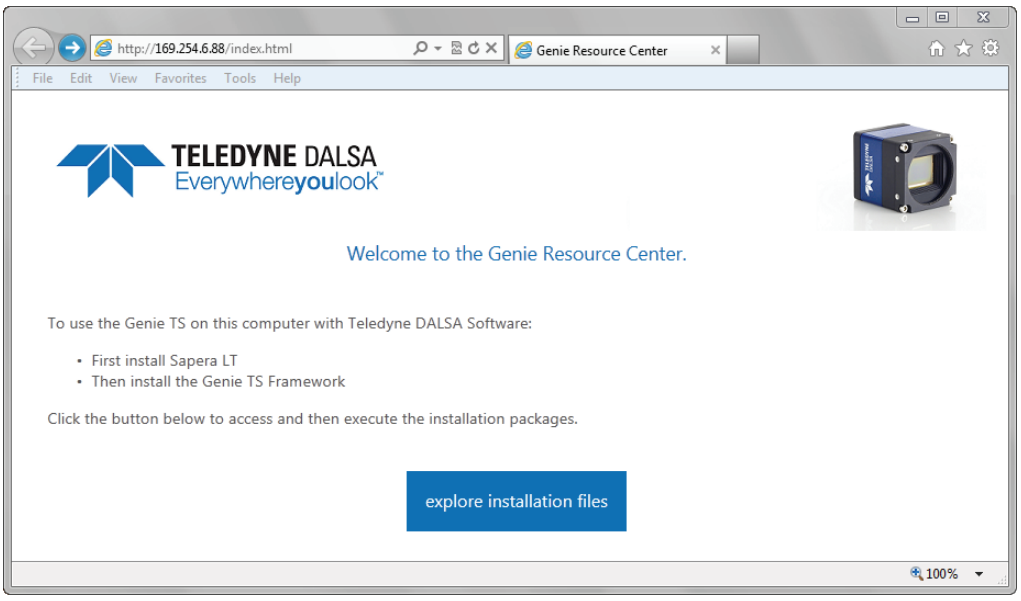

Change sharing options for different network profiles
Windows creates a separate network profile for each network you use. You can choose specific options for each profile.
Home or Work
Public
Network discovery
When network discovery is on, this computer can see other network computers and devices and is visible to other network computers. What is network discovery?
Turn on network discovery
Turn off network discovery
File and printer sharing

- With Windows Explorer, click on Network where the Genie TS is shown as a camera network device (see the following screen capture).
- Note that the discovery process is usually fast but may take up to 10 seconds (tested on a Windows 7 pc) and this delay must be accounted for by any application activating the *deviceUPnPDiscoveryMode* feature.

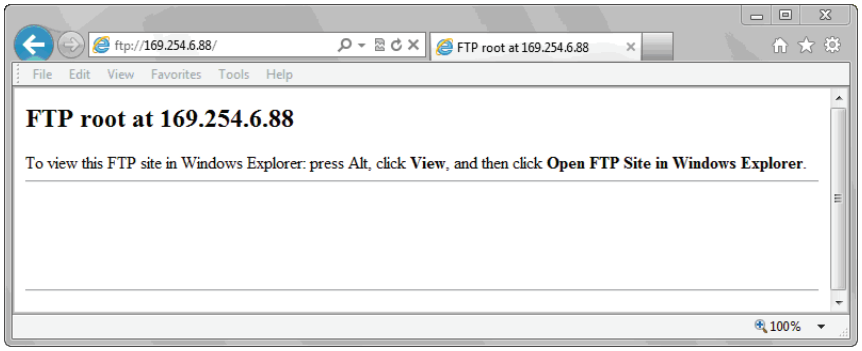


Accessing the Genie TS File Memory

- Double-click the Genie TS icon to access the camera home page as shown below (Windows IE is used as the default browser).


http://169.254.6.88/index.html
Genie Resource Center
File Edit View Favorites Tools Help
TELEDYNE DALSA
Everywhereyoulook™
Welcome to the Genie Resource Center.
To use the Genie TS on this computer with Teledyne DALSA Software:
First install Sapera LT
Then install the Genie TS Framework
Click the button below to access and then execute the installation packages.
explore installation files
100%

- The Genie TS home page presents a short welcome message. Click on the file access button to open a ftp client session, but currently there are no files distributed in the camera. Please go to the Teledyne DALSA support web site to download the latest Sapera LT and Genie TS Framework
- The following figure shows the Genie TS empty FTP space.


ftp://169.254.6.88/
FTP root at 169.254.6.88
File Edit View Favorites Tools Help
FTP root at 169.254.6.88
To view this FTP site in Windows Explorer: press Alt, click View, and then click Open FTP Site in Windows Explorer.
100%

Using the Genie TS File Memory

Any or all of the Genie TS file memory is usable by the user to store data. Folders can be created and files copied to the camera (limited to available space). Any factory distribution files or folders can be deleted to free addition memory.

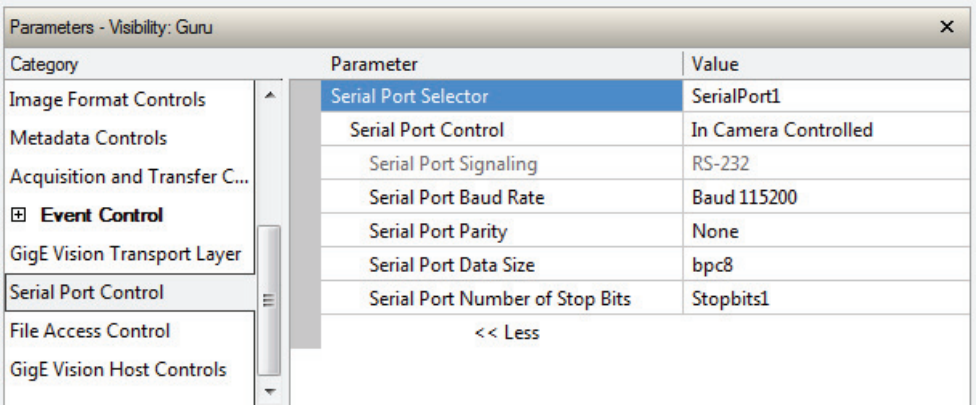
To use available memory:

- From the ftp access window (see previous screen capture) open the View drop menu and click *Open FTP Site in Windows Explorer*.
- Perform any file or folder operation as required. Close the Windows Explorer window when done.
- From the open FTP access window, click the refresh button to view changes. **Note**: The refresh button must be clicked for each folder level to view any changes made.

Serial Port Control Category

The Serial Port control in CamExpert allows the user to select an available camera serial port and review its settings. This section also describes the Genie TS Framework Virtual Serial Port Driver and the use of the Genie TS serial port as an interface from an Ethernet network to a serial port control system for other devices.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



Serial Port Control Feature Descriptions

The Device Version number represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

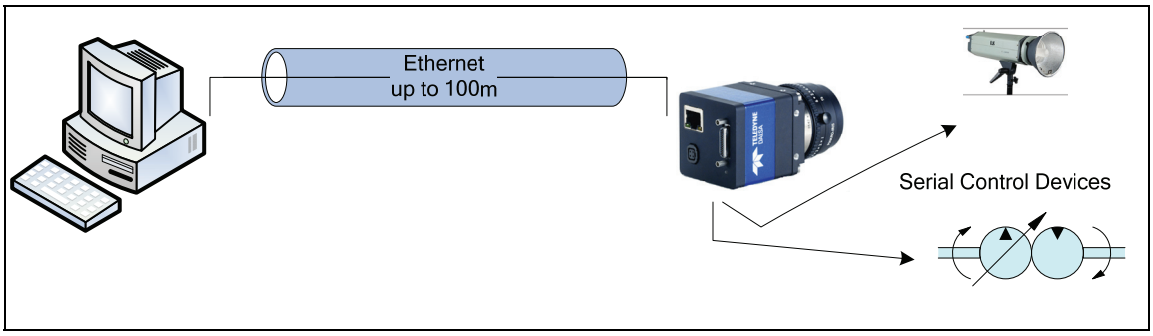
Display Name	Feature & Values	Description	Device Version & View
Serial Port Selector	DeviceSerialPortSelector	Selects the serial port to control.	1.10 Guru
Serial Port 1	*SerialPort1*	*First Serial Port available on the device*	
Serial Port 2	*SerialPort2*	*Second Serial Port available on the device*	
Serial Port Control	deviceSerialPortControlMode	Specifies whether the device serial port is controlled by the device itself or remotely controlled by the host computer.	1.10 DFNC Guru
Remote Host Controlled	*RemoteHostControlled*	*Local serial port is controlled by the host computer*	
In Camera Controlled	*InCameraControlled*	*Local serial port is controlled by the camera itself*	
Serial Port Signaling	deviceSerialPortSignaling	Displays the current serial port signaling protocol in use by the device. This feature selects the protocol if multiple types are supported.	1.10 DFNC Expert
RS-232	*RS232*	*Use RS-232 signaling protocol*	
RS-485	*RS485*	*Use RS-485 signaling protocol*	
None	*None*	*No signaling protocol*	
Serial Port Baud Rate	DeviceSerialPortBaudRate	Sets the baud rate used by the selected device's serial port. Available baud rates are device-specific.	1.10 Expert
Baud 9600	*Baud9600*	*Baud rate is 9600*	

Baud 115200	*Baud115200*	*Baud rate is 115200*	
Serial Port Parity	deviceSerialPortParity	Sets the parity checking type on the selected serial port.	1.10 DFNC Guru
Even	*Even*	*Use Even parity checking*	
Odd	*Odd*	*Use Odd parity checking*	
None	*None*	*Parity checking is disabled*	
Serial Port Data Size	deviceSerialPortDataSize	Sets the bits per character (bpc) to use.	1.10 DFNC Guru
bpc8	*bpc8*	*Use 8 bits per character*	
bpc7	*bpc7*	*Use 7 bits per character*	
Serial Port Number of Stop Bits	deviceSerialPortNumberOfStopBits	Sets the number of stop bits to use.	1.10 DFNC Guru
Stopbits0	*Stopbits0*	*Use no stop bit*	
Stopbits1	*Stopbits1*	*Use 1 stop bit*	
Stopbits2	*Stopbits2*	*Use 2 stop bits*	

Using the Genie TS Framework Virtual Serial Port

The Genie TS provides two serial ports for general use. These are available on the 25-pin Micro-D connector, where one supports RS-232 signals while the second supports RS-485 (see 25-pin Micro-D type Connector Details). Note that this document does not cover the choice of one serial standard over the other, which is dependent on the application and user needs.

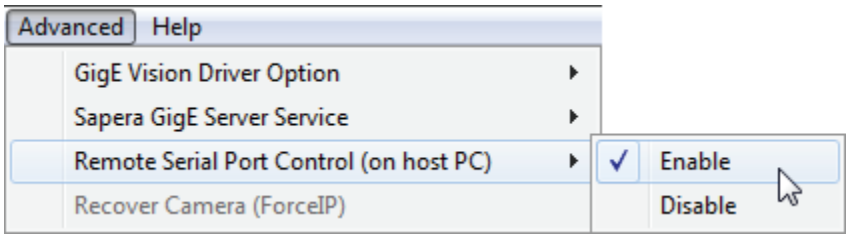
The Genie TS functions as an Ethernet to serial port bridge only, because the Genie does not respond to any serial port commands. External serial controlled devices can be connected to the camera serial ports and benefit from the extended control distance provided by the camera Ethernet connection. Examples of such devices might include lighting, motors, remote switching, various sensors, etc. The following figure shows an example of such a setup.



Enable the Virtual Serial Port Driver

The Virtual Serial Port Driver is automatically installed with the Genie TS Framework. Even if the Genie TS is used only with third part GigE Vision applications, usage of the Genie serial ports requires that the Framework is installed and enabled by using the **Teledyne DALSA Network Configuration tool**.

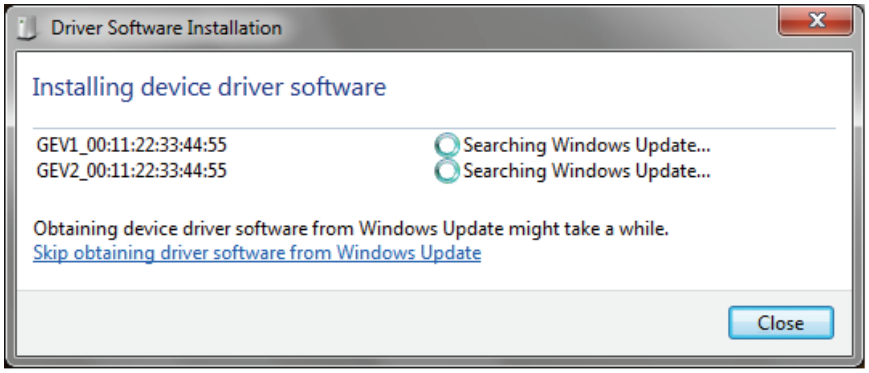
To enable the serial port driver:

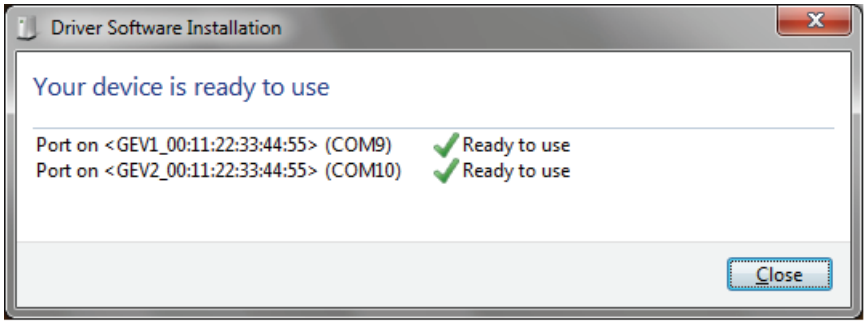


- Run the Teledyne DALSA Network Configuration tool.
- Click on the Advanced menu button.
- Click on Enable for the Remote Serial Port Control menu item.

Automatic Windows Driver Installation

The first time the remote serial port control is enabled on a system, an automatic Windows driver update executes as shown in the following screen captures.

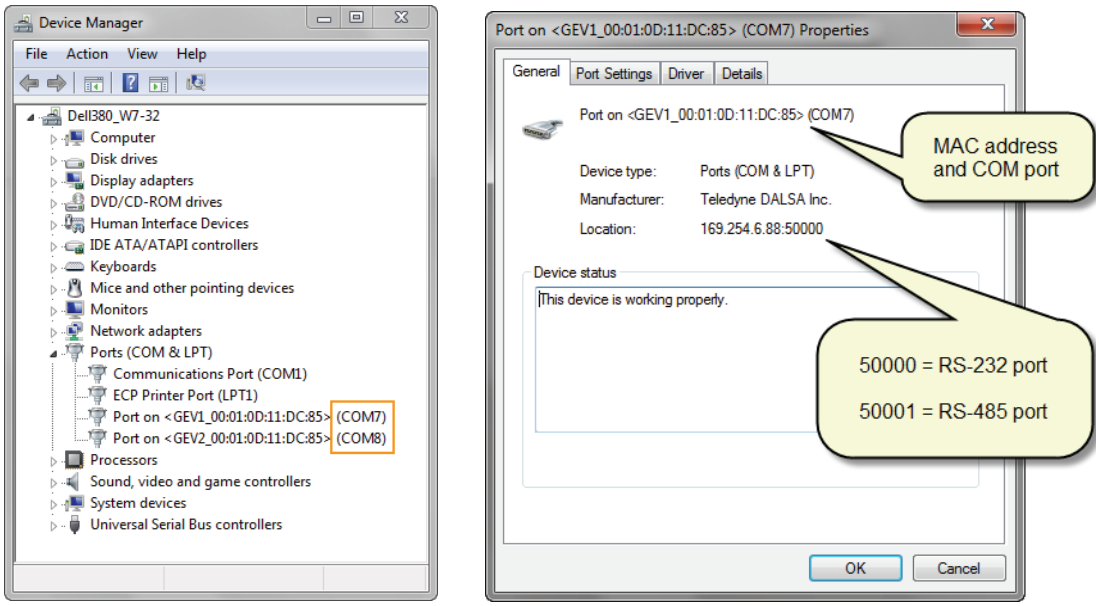




This update procedure will not repeat on an update of the framework unless the serial port control is first disabled and then follow by an uninstall of the Genie TS Framework.

Check the Host PC Mapping of Genie Serial Ports

Using the host PC Device Manager tool, identify the two Genie TS serial ports. In the example shown below the first port is COM7 (RS-232) and the second is COM8 (RS-485), identified by the Genie's MAC address. The second screen capture shows the properties for a Genie Com port, where the first (RS-232) has the ID number *50000*, while the second (RS-485) will have the ID number *50001*.



Selecting Serial Port Parameters

The Sapera CamExpert tool allows selecting a camera serial port and viewing its current configuration.

- With the Port Control set to *RemoteHostControlled* use any third party serial communication program to configure the serial ports and control connected devices. Note that currently, only the Baud rate is variable (within the software control's capabilities).
- With the Port Control set to *InCameraControlled* port parameters are set by Genie TS features as defined in this section.
- Windows XP provided the Hyperterminal tool for serial port control. For Windows Vista and Windows 7, alternative applications such as "Tera Term", "PuTTY", or "Hyper Serial Port" are available from their respective developers.

GigE Vision Host Control Category

The GigE Vision Host controls, as shown by CamExpert, groups parameters used to configure the host computer system GigE Vision features used for Genie TS networking management. None of these parameters are stored in any Genie TS camera.

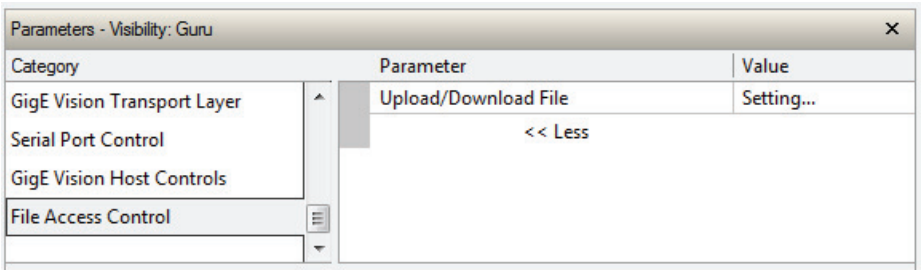
These features allow optimizing the network configuration for maximum Genie bandwidth. Settings for these parameters are highly dependent on the number of cameras connected to a NIC, the data rate of each camera and the trigger modes used.

Information on these features is found in the Teledyne DALSA Network Imaging Module User manual.

File Access Control Category

The File Access control in CamExpert allows the user to quickly upload various data files to the connected Genie TS. The supported data files are for Genie TS firmware updates, Flat Field coefficients, LUT data tables, and a custom image for use as an internal test pattern. Note that a Genie TS Framework installation includes a camera firmware file corresponding to the framework.

Features listed in the description table but tagged as *Invisible* are usually for Teledyne DALSA or third party software usage—not typically needed by end user applications. Also important, Genie TS cameras are available in a number of models implementing different sensors and image resolutions which may not support the full feature set defined in this category.



File Access Control Feature Descriptions

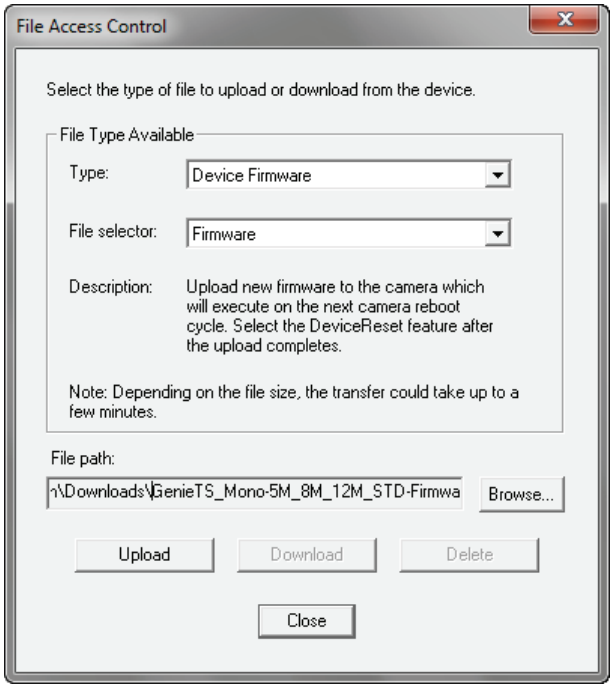
The Device Version number represents the camera software functional group, not a firmware revision number. As Genie TS capabilities evolve the device version tag will increase, therefore identifying the supported function package. New features for a major device version release will be indicated by green text for easy identification.

Display Name	Feature & Values	Description	Device Version & View
File Selector	FileSelector	Selects the file to access. The file types which are accessible are device-dependent.	1.00 Guru
Firmware	*Firmware1*	*Upload new firmware to the camera which will execute on the next camera reboot cycle. Select the DeviceReset feature after the upload completes.*	
Factory FlatField coefficients	*FlatFieldCoefficients0*	*Select factory flatfield coefficients1. These are the factory values when the camera sensor Gain is 1.0.*	
Factory FlatField coefficients 2	*FlatFieldCoefficients00*	*Select factory flatfield coefficients2. These are the factory values used when the camera sensor Gain is 2.65.*	
User FlatField coefficients 1	*FlatFieldCoefficients1*	*Select to read (download), write (upload) or delete the User flatfield coefficients 1.*	
User FlatField coefficients 2	*FlatFieldCoefficients2*	*Select to read (download), write (upload) or delete the User flatfield coefficients 2.*	
*User FlatField coefficients **n***	*FlatFieldCoefficients**n***	*Maximum number of FFC Coefficients is model dependent.*	
User Defined Test Image 1	*UserDefinedImage1*	*Select to write (upload) a User Defined Test Image into the camera's internal image buffer. This camera image buffer is cleared on power-off or when the camera is Reset. Color test images must be a in a color format supported by the camera.*	
User Defined Test Image 2	*UserDefinedImage2*	*User Defined Image 2:*	
*User Defined Test Image **n***	*UserDefinedImage**n***	*Maximum number of User Defined Test Image available is model dependent.*	

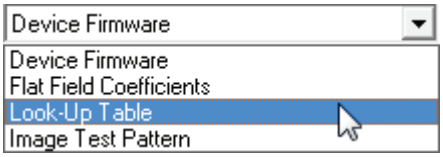
LUT Luminance 1	*LutLuminance1*	*LUT Luminance 1: Select to write (upload) a Look-up-Table file (Sapera .LUT file) into the camera's internal LUT Luminance 1.*	
LUT Luminance 2	*LutLuminance2*	*LUT Luminance 2:*	
LUT Luminance 3	*LutLuminance3*	*LUT Luminance 3:*	
LUT Luminance 4	*LutLuminance4*	*LUT Luminance 4:*	
LUT RGB	*LutRGB*	*Select to write (upload) a Look-up-Table file (Sapera .LUT file) into the camera's internal RGB LUT. v1.20*	
Factory Defective Pixel Map	*BadPixelCoordinate0*	*Select the Factory Defective Pixel Map.*	
User Defective Pixel Map	*BadPixelCoordinate1*	*Select the User Defective Pixel Map.*	
File Operation Selector	FileOperationSelector	Selects the target operation for the selected file in the device. This operation is executed when the File Operation Execute feature is called.	1.00 Guru
Open	*Open*	*Select the Open operation - executed by FileOperationExecute.*	
Close	*Close*	*Select the Close operation - executed by FileOperationExecute*	
Read	*Read*	*Select the Read operation - executed by FileOperationExecute.*	
Write	*Write*	*Select the Write operation - executed by FileOperationExecute.*	
Delete	*Delete*	*Select the Delete operation - executed by FileOperationExecute.*	
File Operation Execute	FileOperationExecute	Executes the operation selected by File Operation Selector on the selected file.	1.00 Guru
File Open Mode	FileOpenMode	Selects the access mode used to open a file on the device.	1.00 Guru
Read	*Read*	*Select READ only open mode*	
Write	*Write*	*Select WRITE only open mode*	
File Access Buffer	FileAccessBuffer	Defines the intermediate access buffer that allows the exchange of data between the device file storage and the application.	1.00 Guru
File Access Offset	FileAccessOffset	Controls the mapping offset between the device file storage and the file access buffer.	1.00 Guru
File Access Length	FileAccessLength	Controls the mapping length between the device file storage and the file access buffer.	1.00 Guru
File Operation Status	FileOperationStatus	Displays the file operation execution status. (RO)	1.00 Guru
Success	*Success*	*The last file operation has completed successfully.*	
Failure	*Failure*	*The last file operation has completed unsuccessfully for an unknown reason.*	
File Unavailable	*FileUnavailable*	*The last file operation has completed unsuccessfully because the file is currently unavailable.*	
File Invalid	*FileInvalid*	*The last file operation has completed unsuccessfully because the selected file in not present in this camera model.*	
File Operation Result	FileOperationResult	Displays the file operation result. For Read or Write operations, the number of successfully read/written bytes is returned. (RO)	1.00 Guru
File Size	FileSize	Represents the size of the selected file in bytes.	1.00 Guru
Device User Buffer	deviceUserBuffer	Unallocated memory available to the user for data storage.	1.10 DFNC Invisible
FTP File Access	ftpFileAccessSupported	Shows whether File Access is supported over FTP.	1.10 DFNC Invisible

File Access via the CamExpert Tool

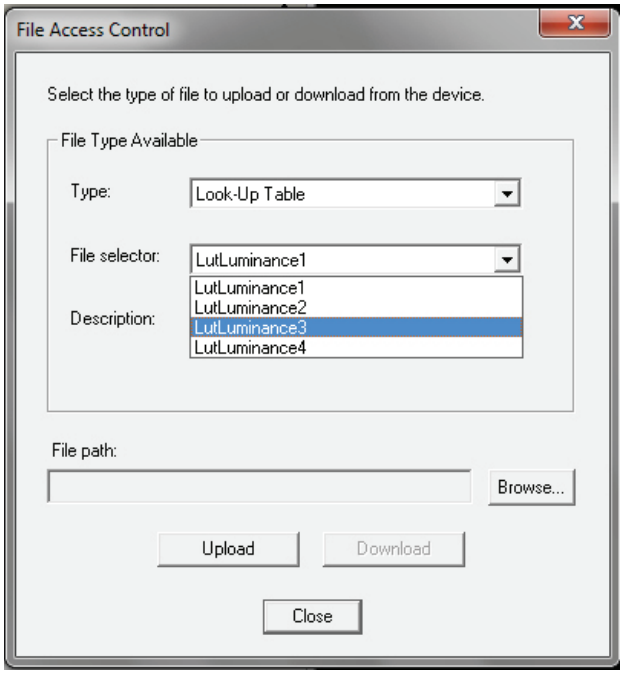
- Click on the "Setting…" button to show the file selection menu.


File Access Control
Select the type of file to upload or download from the device.
File Type Available
Type:
Device Firmware
File selector:
Firmware
Description:
Upload new firmware to the camera which will execute on the next camera reboot cycle. Select the DeviceReset feature after the upload completes.
Note: Depending on the file size, the transfer could take up to a few minutes.
File path:
n\Downloads\GenieTS_Mono-5M_8M_12M_STD-Firmwa
Browse...
Upload
Download
Delete
Close

- From the file type drop menu, select the file type that will be uploaded to the Genie TS. This CamExpert tool allows quick firmware changes or updates, when available for your Genie TS model.



- From the File Selector drop menu, select the Genie TS memory location for the uploaded data. This menu presents only the applicable data locations for the selected file type.



- Click the Browse button to open a typical Windows Explorer window.
- Select the specific file from the system drive or from a network location.
- Click the Upload button to execute the file transfer to the Genie TS.
- Note that firmware changes require a device reset command from the Camera Informtion Controls.

Overview of the *deviceUserBuffer* Feature

The feature *deviceUserBuffer* allows the machine vision system supplier access to 4 kB of reserved flash memory within the Genie TS. This memory is available to store any data required, such as licensing codes, system configuration codes, etc. as per the needs of the system supplier. No Genie TS firmware operation will overwrite this memory block thus allowing and simplifying product tracking and control.

Network Overview & Tools

Genie IP Configuration Mode Details

The following descriptions provide more information on the IP configuration modes supported by Genie. In general automatic IP configuration assignment (LLA/DHCP) is sufficient for most Genie installations.

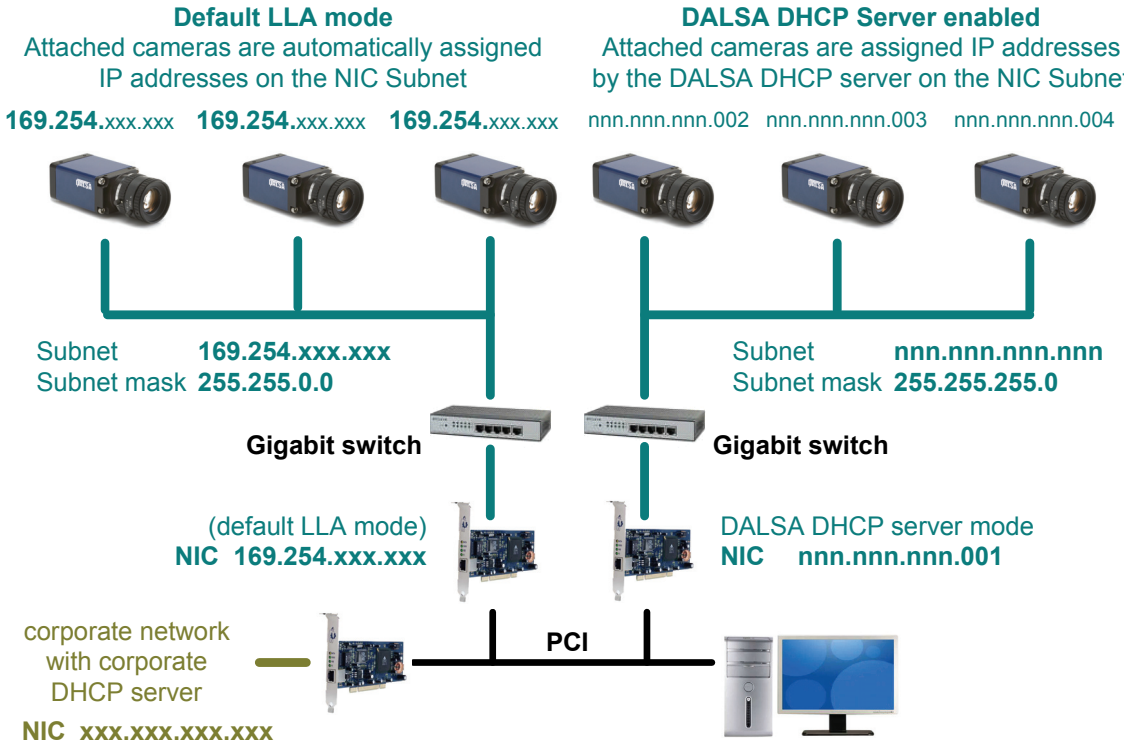
Please refer to the Teledyne DALSA Network Imaging Package manual for information on the Teledyne DALSA Network Configuration tool and network optimization for GigE Vision cameras and devices.

Link-Local Address (LLA)

- LLA is also known as Auto-IP. It is used for unmanaged networks including direct connections from a GigE Vision device to a dedicated NIC.
- A subnet configured with LLA cannot send packets across routers but only via Ethernet switches.
- LLA is the recommended scheme when only one NIC is connected to GigE cameras. LLA is fully automatic requiring no user input.
  Ensure only one NIC is using LLA on your PC, otherwise IP conflicts will result.
- The NIC will automatically assign a random IP address within the 169.254.x.x subnet. The LLA protocol ensures there are no conflicts with other devices through an arbitration scheme.
- The Windows NIC configuration must be set to DHCP (the typical default case) and no DHCP server must be present on the network. Otherwise, an IP address gets assigned by the DHCP server. Windows will turn to LLA when no DHCP server answers requests coming from the NIC.
- Windows XP takes about 1 minute to obtain an LLA IP address – Windows Vista/7 will take about 6 seconds. With Windows XP, with no DHCP server involved, the network adapter icon in the system tray (in Windows XP) typically shows "limited or no connectivity".
  This is normal (see Microsoft KB article #892896) and indicates that the network does not have connectivity beyond routers.
- Windows and Genie are still running the DHCP process in the background. If a DHCP server becomes available on the network, the NIC will get a DHCP assigned IP address for the connected device but connections on the LLA IP address will be lost. The Teledyne DALSA Network Configuration Tool can enable the Teledyne DALSA DHCP server on the NIC used for the GigE Vision network.
- Important: If the host system has multiple NIC devices configured with LLA, then the communication stack cannot accurately resolve which NIC to forward an IP packet on the 169.254 segment. Limit the number of NIC configured using LLA to one interface. It is preferable that the Teledyne DALSA DHCP server is used instead of LLA mode (see next section).
- Use the Teledyne DALSA Network Configuration Tool to change the Genie from the default DHCP/LLA mode to Persistent IP mode when required, such as when there are multiple NIC devices with Genie connected to each. Note that Teledyne DALSA recommends DHCP/LLA as the mode of operation where a switch is used to connect multiple Genie devices.

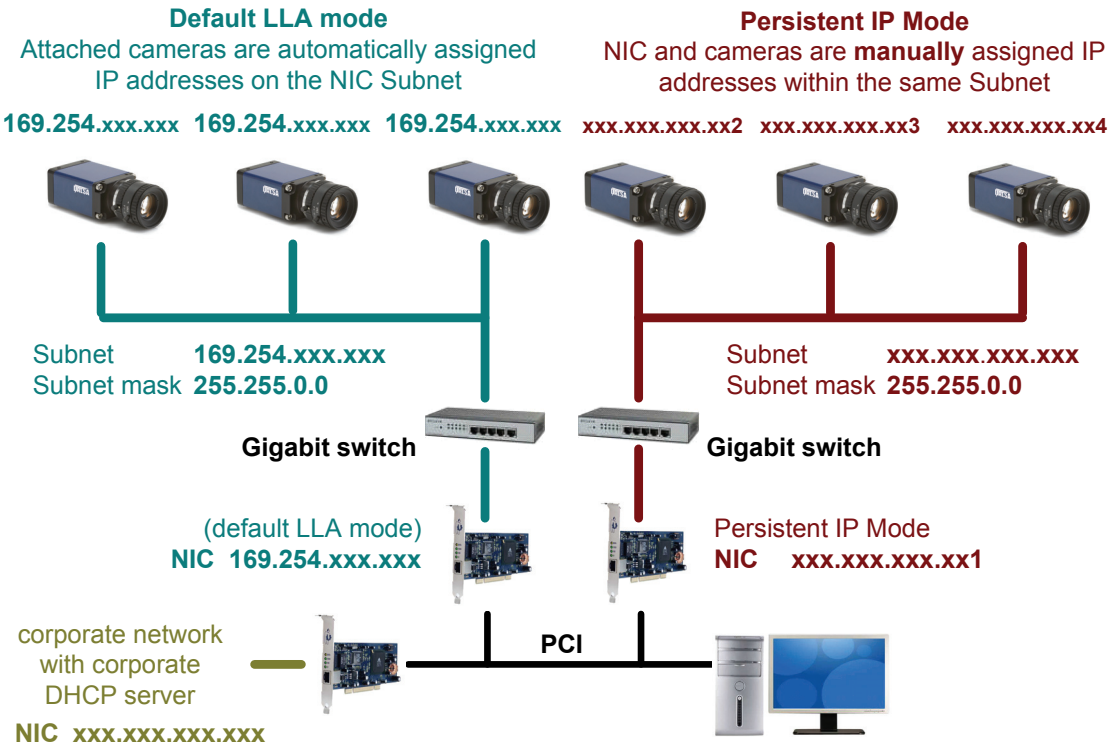
DHCP (Dynamic Host Configuration Protocol)

- This IP configuration mode requires a DHCP server to allocate an IP address dynamically over the range of some defined subnet. The Genie camera must be configured to have DHCP enabled. This is the factory default setting.
- The DHCP server is part of a managed network. Windows itself does not provide a DHCP server function therefore a dedicated DHCP server is required. The Teledyne DALSA Network Configuration Tool can configure the Teledyne DALSA DHCP server on the NIC used for the GigE Vision network.
- The Teledyne DALSA DHCP server is recommended where there are multiple NIC ports with multiple GigE Vision devices attached. Each NIC port must use a different subnet to avoid IP address conflicts . Persistent IP assignment is required if there is no DHCP server for any additional subnet.
- Under Windows, a NIC is configured in DHCP mode by default. If no DHCP server is present on a given subnet, Windows will revert to LLA as explained in the section above.
- Ensure that a different subnet is assigned to each NIC on the network. This will automatically be managed correctly when the Teledyne DALSA DHCP server is enabled on one or all subnets used for GigE Vision devices. The graphic below illustrates a system with one NIC having the Teledyne DALSA DHCP server enabled.



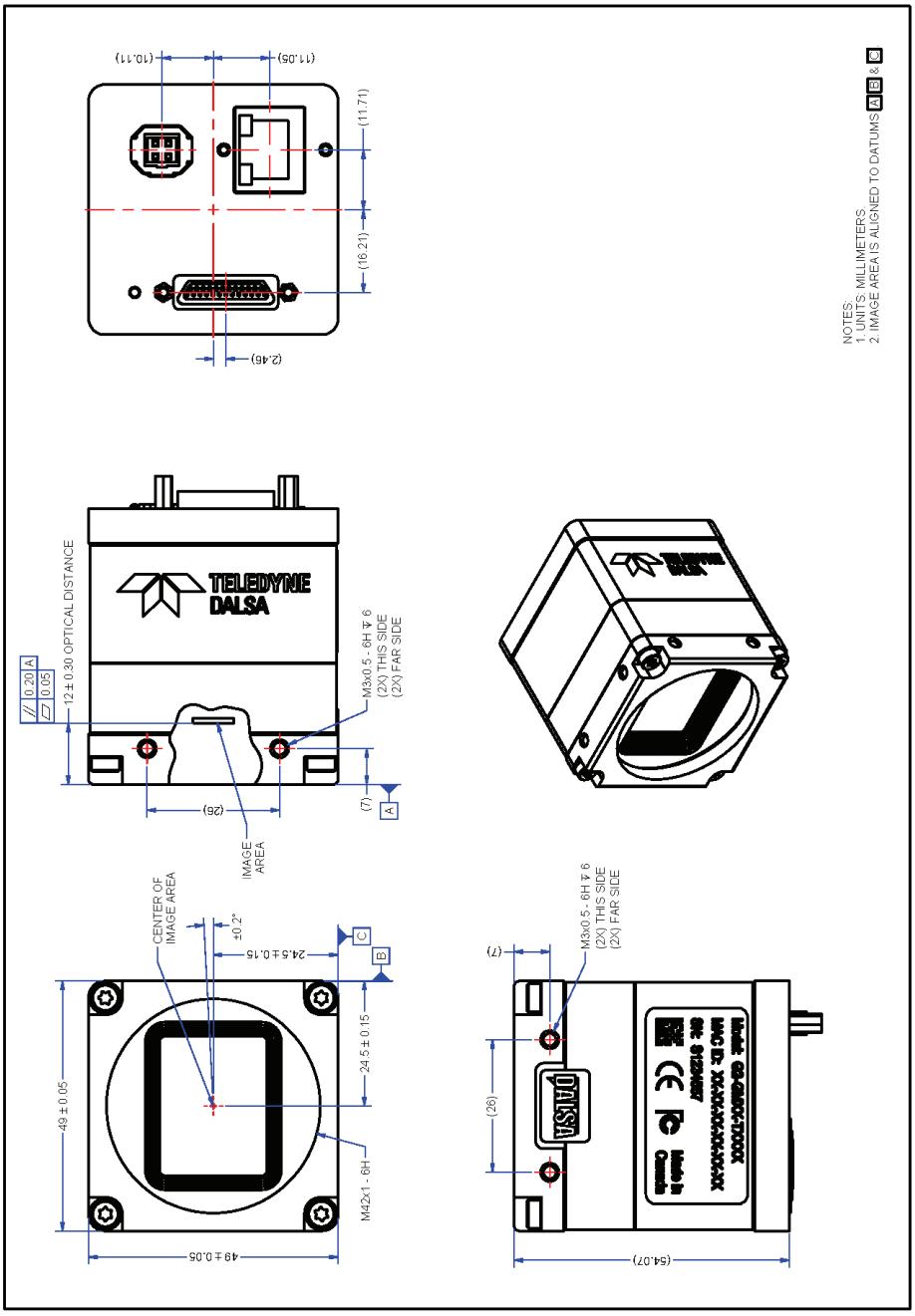
Persistent IP

- This configuration is only suggested if the user fully controls the assignment of IP addresses on the network.
- The GigE Vision camera is forced a static IP address. The NIC IP address must use the same subnet otherwise the camera is not accessible.
- If the Genie camera is connected to a network with a different subnet, it cannot be accessed.
- The Teledyne DALSA Network Configuration Tool is used to set a persistent IP address. Refer to the Teledyne DALSA Network Imaging manual.
- An example of a Persistent IP address assignment on a class B network:
  - NIC Subnet = 192.168.1.1
  - Subnet Mask = 255.255.0.0
  - Persistent IP = 192.168.1.2
  - Default Gateway = 0.0.0.0
- Warning: an incorrect IP address assignment might make it impossible to connect to the camera. In such a case the Teledyne DALSA Network Configuration tool includes a function to recover a Genie camera with an unknown persistent IP and set the Genie to the factory default setting, i.e. DHCP/LLA mode. The camera MAC address must be known to use this function.
- For GigE Vision applications the FORCEIP command is used to force a new persistent IP or to change the IP configuration protocol. The Genie MAC address must be known to use the FORCEIP command.
- The following illustration shows a functional computer setup with three NIC ports, but no DHCP server. Two NIC ports are used for private GigE Vision networks. The first uses the default LLA mode for IP addresses, while the second NIC and the cameras connected to it are configured with persistent IP addresses. An application on the computer can control each Genie camera, on each subnet, without conflict.



Technical Specifications

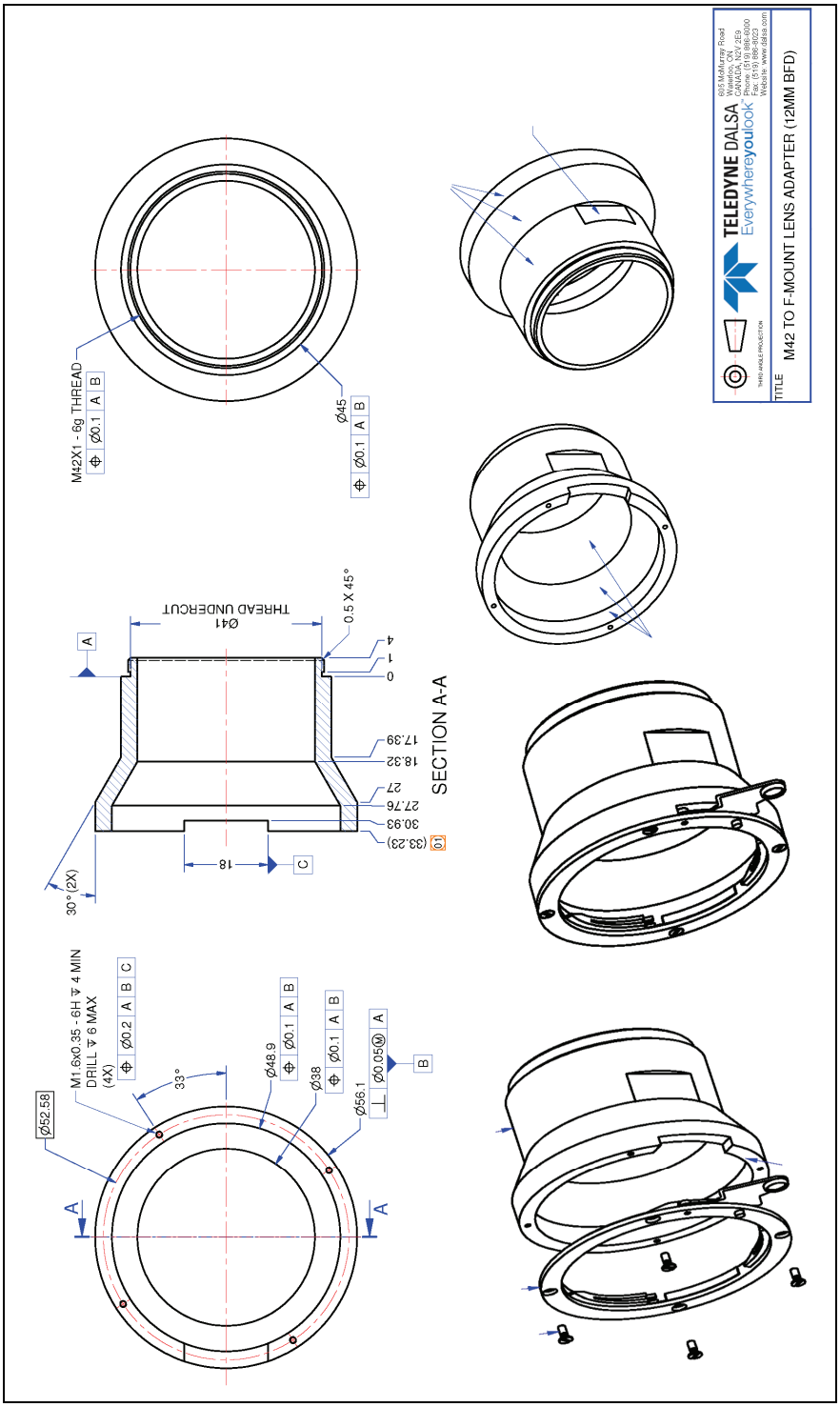
Mechanical Specifications: TS-M4096, TS-M3500, TS-M2500, TS-C4096, TS-C3500, TS-C2500



Note: Genie TS with M42x1 Lens Mount

M42x1 to Nikon F Bayonet Adapter

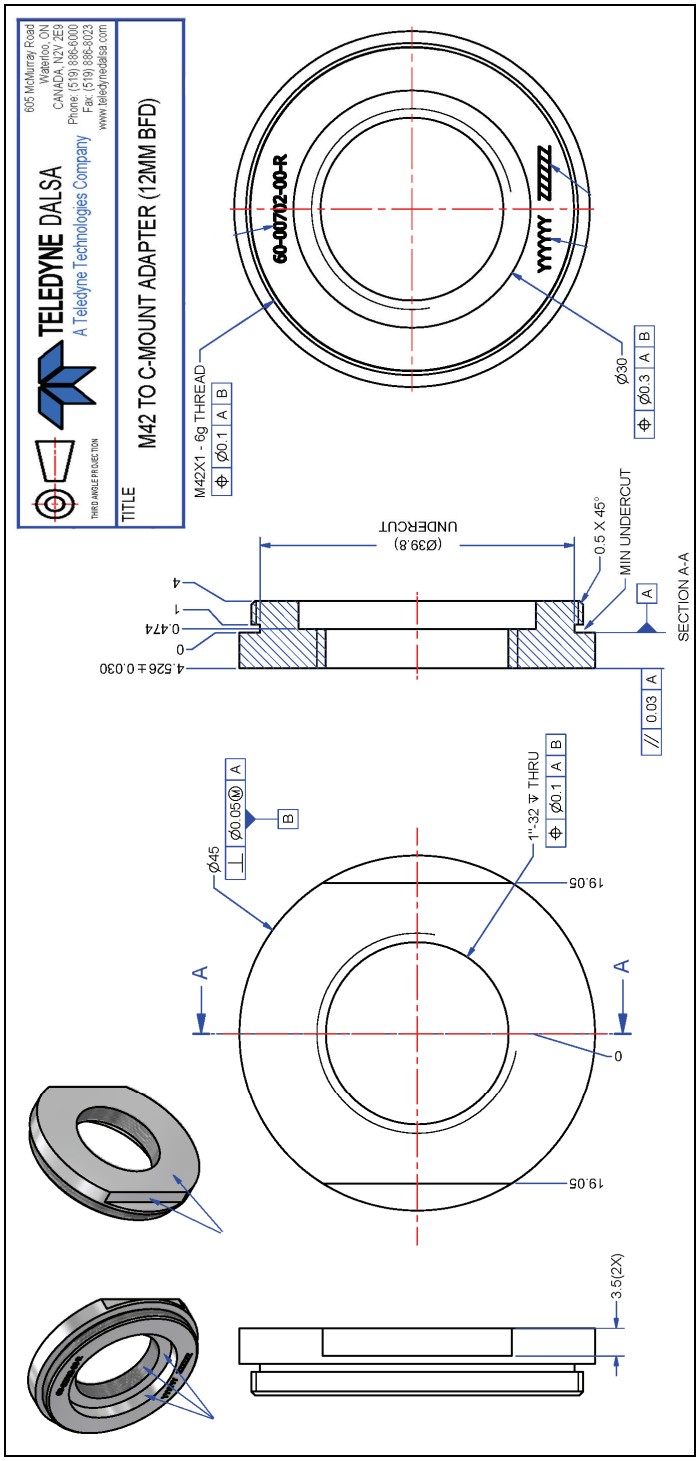
See Lenses for the Genie TS with M42 or with Nikon F-mount for information on lens selection relative to Genie TS model used.



Nikon F Bayonet to M42x1 Adapter

M42x1 to C-Mount Adapter

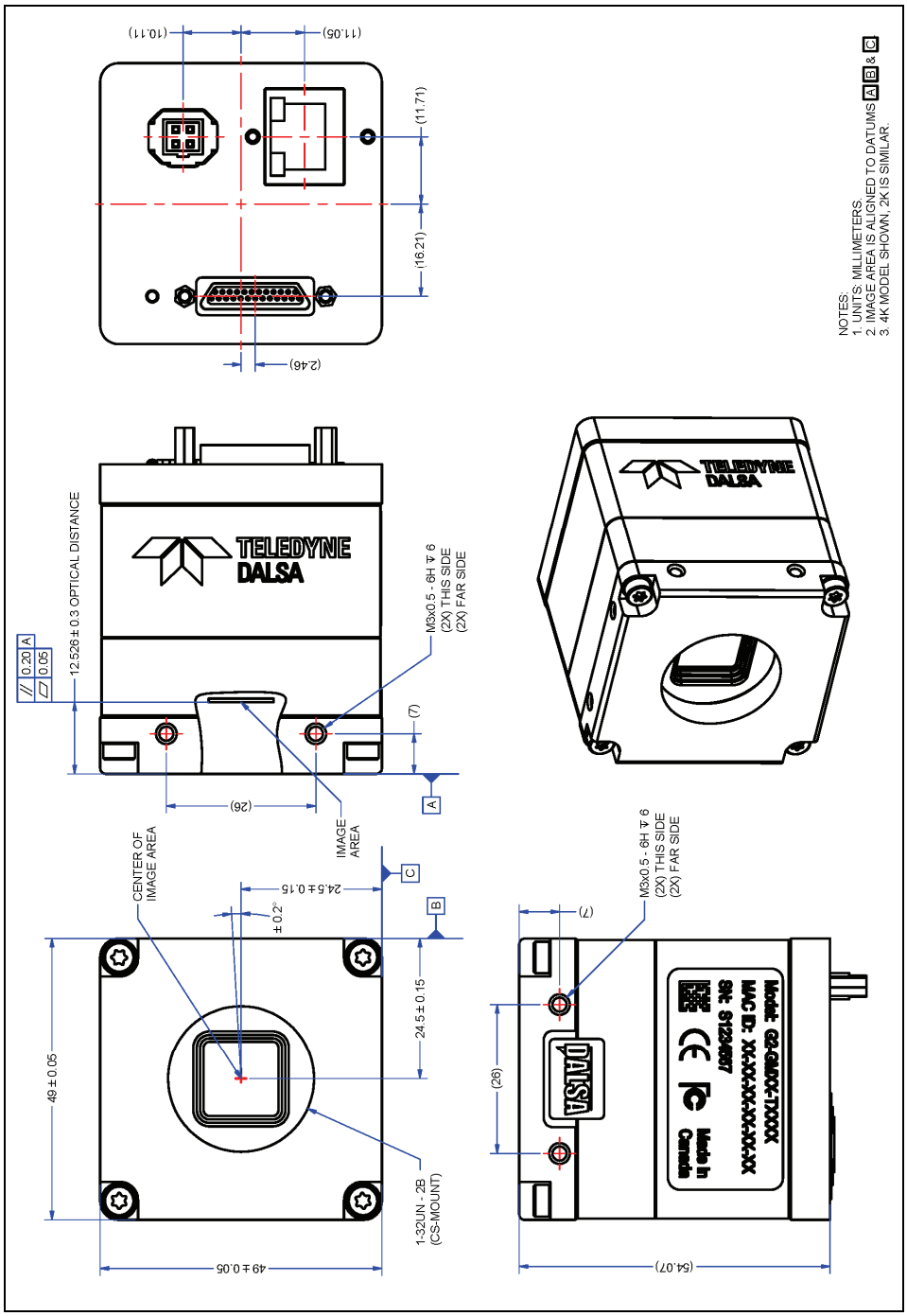
See Lenses for the Genie TS (5M) with the optional C-Mount Adapter for information on lens selection.



M42 to C-Mount Adapter

Mechanical Specifications: TS-M1920, TS-M2048

See Lenses for the Genie TS with CS-Mount (2M or 4M) for information on lens selection.



Note: Genie TS with CS Lens Mount

Additional Notes on Genie TS Identification and Mechanical

Identification Label

Genie TS cameras have an identification label applied to the bottom side, with the following information:

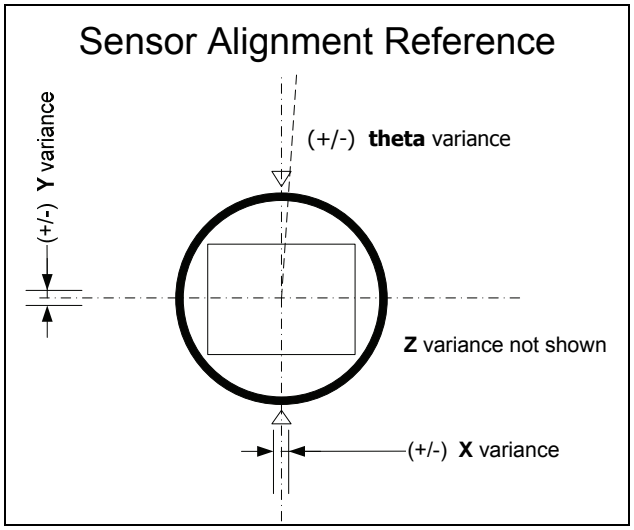
Model Part number
Serial number
MAC ID
2D Barcode
CE and FCC logo
“Made in Canada” Statement

Additional Mechanical Notes

Genie supports a screw lock Ethernet cable (see "Ruggedized RJ45 Ethernet Cables" on page 173).
For information on Genie lens requirements see "Optical Considerations" on page 169.
Each camera side has two mounting holes in identical locations, which provide good grounding capabilities.
Overall height or width tolerance is ± 0.05mm.

Sensor Alignment Specification

The following figure specifies sensor alignment for Genie TS where all specifications define the absolute maximum tolerance allowed for production cameras. Dimensions "x, y, z", are in microns and referenced to the Genie TS mechanical body or the optical focal plane (for the z-axis dimension). Theta specifies the sensor rotation relative to the sensor's center and Genie mechanical.



	DALSA Vouvray	CMOSIS	AnaFocus
X variance	+/- 150 microns	+/- 150 microns	+/- 500 microns
Y variance	+/- 150 microns	+/- 150 microns	+/- 500 microns
Z variance	+/- 300 microns	+/- 300 microns	+/- 500 microns
Theta variance	+/- 0.2 degrees	+/- 0.2 degrees	+/- 0.5 degrees

Connectors

- A single **RJ45 Ethernet** connector for control and video data to the host Gigabit NIC. Additionally for PoE, the Genie TS requires an appropriate PoE Class 0 or Class 3 (or greater) power source device (such as a powered computer NIC, or a powered Ethernet switch, or an Ethernet power injector). For industrial environments, Genie supports the use of screw lock Ethernet cables (see "Ruggedized RJ45 Ethernet Cables" on page 173). Note that for PoE installations, a shielded Ethernet cable is required to provide a camera ground connection to the controlling computer.
- A single 4-pin Iris connector for lens control.
- A single CMD-25 connector for all Genie TS I/O and an auxiliary DC power source.

25-pin Micro-D type Connector Details

Pin Number	Genie TS	Direction	Definition
1	PWR-GND	-	Camera Power - Ground
2	PWR-VCC	-	Camera Power – DC +12 to +24 Volts
3	RSV	-	Reserved
4	Lens-GND	-	Lens Common Ground
5	Lens-Zoom+	Out	Lens Motor Zoom +
6	Lens-Zoom-	Out	Lens Motor Zoom -
7	Lens-Focus+	Out	Lens Motor Focus +
8	Lens-Focus-	Out	Lens Motor Focus -
9	Lens-Iris+	Out	Lens Motor Iris +
10	Lens-Iris-	Out	Lens Motor Iris -
11	RS-GND	-	Communication Common Ground
12	RS232-TX	Out	Communication RS-232 Transmit (EIA/TIA-232E)
13	RS232-RX	In	Communication RS-232 Receive (EIA/TIA-232E)
14	OUT-CMN	-	Opto Output Common
15	OUT-Line 1	Out	Opto Output Port 1
16	OUT-Line 2	Out	Opto Output Port 2
17	OUT-Line 3	Out	Opto Output Port 3
18	OUT-Line 4	Out	Opto Output Port 4
19	IN-CMN	-	Opto Input Common
20	IN-Line 1	In	Opto Input Port 1
21	IN-Line 2	In	Opto Input Port 2
22	IN-Line 3	In	Opto Input Port 3
23	IN-Line 4	In	Opto Input Port 4
24	RS485-P	In/Out	Communication RS-485 -
25	RS485-N	In/Out	Communication RS-485 +

Mating Connectors and Cable Assemblies

The Molex mating connector (Molex part Number: 83424-9014) is required for user manufactured custom cable assemblies. The Molex company (molex.com) also provides a number of cable assemblies ready for order as shown in the following table.

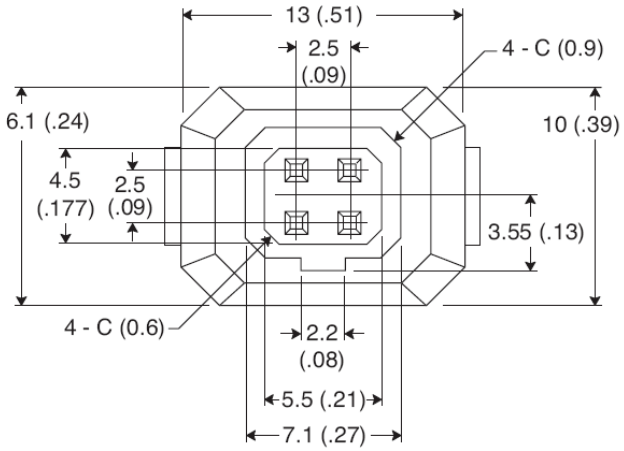
Molex Wire Cable Sets	CMD-25 to CMD-25 Cable Sets	CMD-25 to D-Sub Socket Cable Sets
18" 83424-9019	18" 83424-9057	18" 83424-9063
36" 83424-9020	36" 83424-9058	36" 83424-9064
72" 83424-9021	72" 83424-9059	72" 83424-9065

Power over Ethernet (PoE) Support

- The Genie TS requires a PoE Class 0 or Class 3 (or greater) power source when not using a separate external power source connected to pins 1 & 2 of the 25-pin Micro-D Connector.
- To use PoE, the camera setup requires a powered computer NIC, or a powered Ethernet switch, or an Ethernet power injector.
- The Genie TS is protected and will not fail in the case of have both an external supply and PoE connected at the same time.
- If both supplies are connected and active, the Genie will use PoE as the camera power supply.

Video Iris Connector Details

- Support for industry standard motorized C-Mount lenses.
- The Genie TS Auto-Iris pinout supports both the Video and DC signal modes.
- If a lens with a nonstandard Auto-iris pin out is used, the camera will:
  - Not suffer any internal component damage.
  - Continue operating without the lens.
  - Notify the user via an event message.



KOBICONN 163-158N-2-E connector

Iris Connector – Video Mode

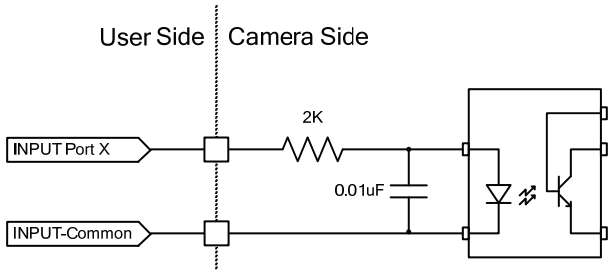
Pin	Signal	Direction	Definition
1	LENS-PWR	Out	Lens Power (12V – 100mA)
2	RSV	-	Reserved
3	LENS-VIDEO	Out	Lens Video
4	LENS-GND	Out	Lens Ground

Iris Connector – DC Mode

Pin	Signal	Direction	Definition
1	LENS-Control-	Out	Lens Control – (3.6V – 48mA)
2	LENS-Control+	Out	Lens Control +
3	LENS-DRV+	Out	Lens Drive + (3.6V – 48mA)
4	LENS-DRV-	Out	Lens Drive -

Input Signals Electrical Specifications

External Inputs Block Diagram



External Input Details

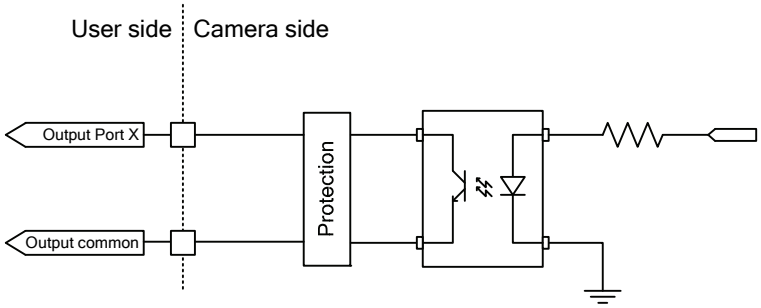
- Opto-coupled (2.4V to 24V) with internal current limit.
- Selectable input trigger threshold levels for TTL, 12V, and 24V signal inputs (see *lineDetectionLevel* feature).
- Used as trigger acquisition event, counter or timestamp event, or integration control.
- User programmable debounce time from 0 to 255µs in 1µs steps.
- Source signal requirements:
  - Single-ended driver meeting TTL, 12V, or 24V standards
  - Differential signal drivers cannot be used due to the shared input common

External Input Timing Reference

Input Level Standard	Maximum Input Frequency	Minimum Pulse Width	Source Current Requirements	Maximum Signal Propagation Delay at 60°C *Input Signal Direction*	
TTL (3.3V)	86 kHz	9.5 µs	1.2 mA	0 to 3.3V	17 µs
				3.3V to 0	19 µs
TTL (5.0V)	43 kHz	5.6 µs	1.2 mA		
12V	360 kHz	4.8 µs	6 mA	0 to 12V	10 µs
				12V to 0	12 µs
24V	230 kHz	4.1 µs	12 mA	0 to 24V	9 µs
				24V to 0	11 µs

Output Signals Electrical Specifications

External Outputs Block Diagram



External Output Details

- Programmable output mode such as strobe, event notification, etc (see *outputLineSource* feature)
- Outputs are open on power-up with the default factory settings
- A software reset will not reset the outputs to the open state if the outputs are closed
- A user setup configured to load on boot will not reset the outputs to the open state if the outputs are closed
- No output signal glitch on power-up or polarity reversal

- Protection Circuit – DC Ratings:
  - Output protected by a resettable fuse and voltage limiter
  - Output typical operating resistance of 220 ohm
  - Output maximum voltage of 26V at 10 mA, (60°C)

Computer Requirements for Genie Cameras

The following information is a guide to computer and networking equipment required to support the Genie camera at maximum performance. The Genie camera series complies with the current IPv4 Internet Protocol, therefore current Gigabit Ethernet (GigE) equipment should provide trouble free performance.

Host PC System

- Operating System: Windows XP, Windows Vista, Windows 7 (either 32-bit or 64-bit for all) are supported.

Network Adapters

- GigE network adapter (either add on card or on motherboard). The Intel PRO/1000 MT adapter is an example of a high performance NIC. Typically a system will need an Ethernet GigE adapter to supplement the single NIC on the motherboard.
- PCI Express adapters will outperform PCI adapters.
- Network adapters that support Jumbo Frames will outperform adapters with fixed packet size frames.

Laptop Information

- Older laptop computers with built in GigE network adapters may still not be able to stream full frame rates from Genie. Thorough testing is required with any laptop computer to determine the maximum frame rate possible (refer to the Teledyne DALSA Network Imaging Package user's manual).

Ethernet Switch Requirements

When there is more than one device on the same network or a camera-to-PC separation greater than 100 meters, an Ethernet switch is required. Since the Genie GigE camera complies with the Internet Protocol, it should work with all standard Ethernet switches. However, switches offer a range of functions and performance grades, so care must be taken to choose the right switch for a particular application.

IEEE 802.3x Pause Frame Flow Control

Ethernet Switches supporting Full-duplex IEEE 802.3x Pause Frame Flow Control must be used in situations where multiple cameras may be triggered simultaneously. In such a case the NIC maximum bandwidth would be exceeded if there was no mechanism to temporarily hold back data from cameras. Genie cameras support the IEEE 802.3x pause frame flow control protocol automatically so that images from many cameras can be transmitted through the switch to the NIC efficiently, without data loss. As a working example, one such switch tested at Teledyne DALSA is the NETGEAR GS716T.

Important: The maximum frame rate possible from a large number of Genie cameras which are simultaneously triggered will depend on the Genie model, frame size, and network details. Additionally using Pause Frame may change the Jumbo Frame value which maximizes data throughput. Each imaging system should be tested for data rate limits.

Ethernet to Fiber-Optic Interface Requirements

In cases of camera-to-PC separations of more than 100 meters but an Ethernet switch is not desired, a fiber-optic media converter can be used. The FlexPoint GX from Omnitron Systems (www.omnitron-systems.com) converts GigE to fiber transmission and vice versa. It supports multimode (MM) fiber over distances of up to 220 m (720 ft.) and single-mode (SM) fiber up to 65 km (40 mi.) with SC, MT-RJ, or LC connector types.

Important: The inclusion in this manual of GigE to fiber-optic converters does not guarantee they will meet specific application requirements or performance. The user must evaluate any supplemental Ethernet equipment.

EC & FCC Declarations of Conformity

Models: TS-M4096, TS-C4096, TS-M3500, TS-C3500, TS-M2500, TS-C2500

TELEDYNE DALSA
Everywhereyoulook™

EC & FCC DECLARATION OF CONFORMITY

We : Teledyne DALSA inc.
7075 Place Robert-Joncas, Suite 142,
St. Laurent, Quebec, Canada, H4M 2Z2

Declare under sole legal responsibility that the following products conform to the protection requirements of council directive 2004/108/EC on the approximation of the laws of member states relating to electromagnetic compatibility:

Genie TS 5M, 8M and 12M

The products to which this declaration relates are in conformity with the following relevant harmonized standards, the reference numbers of which have been published in the Official Journal of the European Communities:

EN55011:2009, A1:2010
EN55022:2010
EN61000-4-2:2008
EN61000-4-3:2006, A1:2007, A2:2010
EN61000-4-4:2004
EN61000-4-5:2005
EN61000-4-6:2008
EN61000-4-8:2009
EN61000-4-11:2004

Further declare under our sole legal responsibility that the product listed conforms to the Code of Federal Regulations, Title 47, Part 15 (2010), subpart B, for a class A product.

St. Laurent, Canada — Location
2012-03-23 — Date

Eric Carey

Eric Carey, ing.
Director,
Research and Development

Models: TS-M1920, TS-C1920, TS-M2048, TS-C2048

TELEDYNE DALSA
Everywhereyoulook™

EC & FCC DECLARATION OF CONFORMITY

We : Teledyne DALSA inc.
7075 Place Robert-Joncas, Suite 142,
St. Laurent, Quebec, Canada, H4M 2Z2

Declare under sole legal responsibility that the following products conform to the protection requirements of council directive 2004/108/EC on the approximation of the laws of member states relating to electromagnetic compatibility:

Genie TS 2M and 4M

The products to which this declaration relates are in conformity with the following relevant harmonized standards, the reference numbers of which have been published in the Official Journal of the European Communities:

EN55011:2009, A1:2010
EN55022:2010
EN61000-4-2:2008
EN61000-4-3:2006, A1:2007, A2:2010
EN61000-4-4:2004
EN61000-4-5:2005
EN61000-4-6:2008
EN61000-4-8:2009
EN61000-4-11:2004

Further declare under our sole legal responsibility that the product listed conforms to the Code of Federal Regulations, Title 47, Part 15 (2010), subpart B, for a class A product.

St. Laurent, Canada — Location
2013-01-22 — Date

Eric Carey, ing.
Director,
Research and Development

Model: TS-M2560

TELEDYNE DALSA
Everywhereyoulook™

EC & FCC DECLARATION OF CONFORMITY

We : Teledyne DALSA inc.
7075 Place Robert-Joncas, Suite 142,
St. Laurent, Quebec, Canada, H4M 2Z2

Declare under sole legal responsibility that the following products conform to the protection requirements of council directive 2004/108/EC on the approximation of the laws of member states relating to electromagnetic compatibility:

Genie TS 5M

The products to which this declaration relates are in conformity with the following relevant harmonized standards, the reference numbers of which have been published in the Official Journal of the European Communities:

EN55011:2009, A1:2010
EN55022:2010
EN61000-4-2:2008
EN61000-4-3:2006, A1:2007, A2:2010
EN61000-4-4:2012
EN61000-4-5:2005
EN61000-4-6:2008
EN61000-4-8:2009
EN61000-4-11:2004

Further declare under our sole legal responsibility that the product listed conforms to the Code of Federal Regulations, Title 47, Part 15 (2012), subpart B, for a class A product.

St. Laurent, Canada — Location
2014-07-16 — Date

Eric Carey, ing.
Director,
Research and Development

Additional Reference Information

Lens Selection Overview

This section provides a general overview to selecting a lens for the various models of Genie TS. The first two lens parameters, Lens Mount and Lens Image Circle, are based on correctly matching the lens to the Genie TS model used. Brief information on other lens parameters to consider follows those sections.

Lens Mount Types

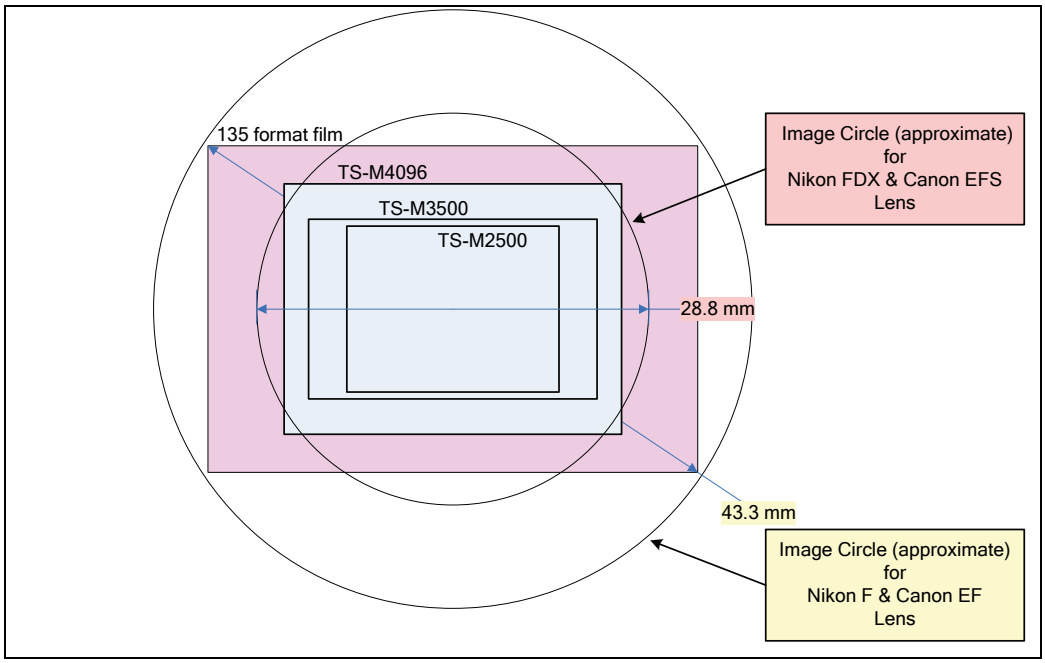
Genie TS cameras (models TS-M4096, TS-M3500, TS-M2500) use a M42x1 lens screw mount and have optional adapters for F-mount and C-mount lenses. Models TS-M1920 and TS-M2048 only are available with a CS-mount.

Larger sensors, such as the TS-M4096, TS-M3500, TS-M2500 models, come with the M42 mount to ensure even illumination from the lens used. Genie TS cameras with CS mounts can use optional C-mount lens adapters. The following sections describe the image size requirement for the different Genie TS mounts and sensor models.

Lenses for the Genie TS with M42 or with Nikon F-mount adapter

The graphic below shows the relative sizes of the active sensor regions for Genie TS models TS-M4096 (12 megapixel), TS-M3500 (8 megapixel), and TS-M2500 (5 megapixel). These are compared to the approximate image circles of full-frame film SLR camera lenses and the lens series commonly used with popular DSLR cameras.

The Genie TS-M4096 model is subject to a drop in illumination at the sensor corners when used with common DSLR lenses. The user should compensate by enabling Flat Field Correction after performing a FFC calibration with the chosen lens.

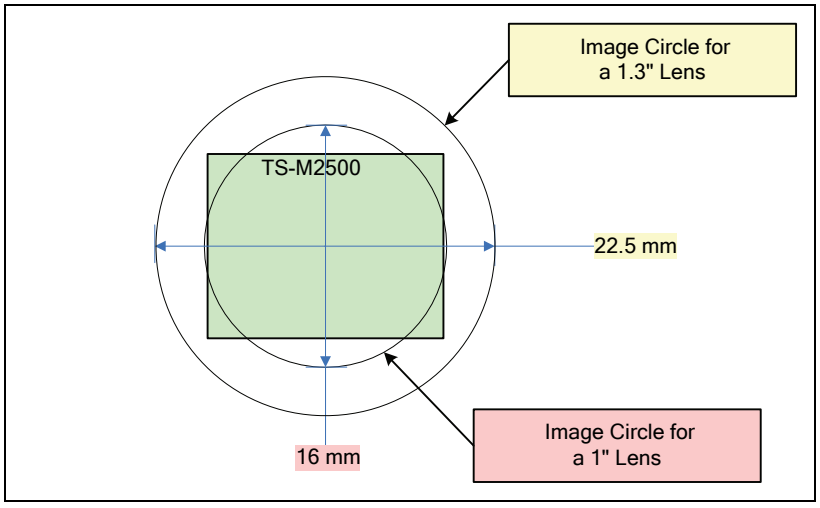


Lenses for the Genie TS (5M) with the optional C-Mount Adapter

Requires the Genie TS M42 to C-Mount Lens Adapter (G2-AM42-MOUNT0)

The following graphic shows the relative image circle sizes of typical 1” and 1.3” machine vision C-Mount lenses, when used with a 5 megapixel Genie TS model (TS-M2500 & TS-C2500).

Using a 1” lens, a drop in illumination at the sensor corners is expected. The user should compensate by enabling Flat Field Correction after performing a FFC calibration with the chosen lens.

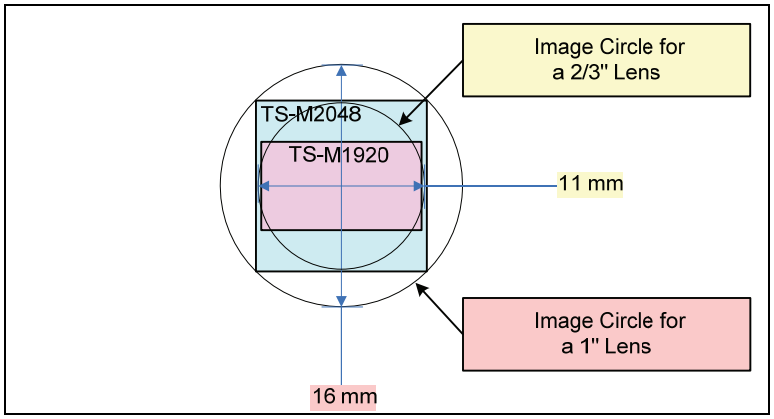


Lenses for the Genie TS with CS-Mount (2M or 4M)

Genie TS models TS-M1920 and TS-M2048, are designed for CS-mount lenses (or C-mount with an adapter ring). The following graphic shows the relative image circle sizes of typical 2/3” and 1” machine vision CS-Mount lenses.

When using a 2/3” lens with the TS-M1920, a slight drop in illumination at the sensor corners is expected. The user should compensate by enabling Flat Field Correction after performing a FFC calibration with the chosen lens. The graphic shows this model configured in the HD video format of 1920x1080 pixels, verses its maximum format of 2048x1088 pixels.

For Genie TS model TS-M2048, a 1” lens is required to have proper illumination.



Additional Lens Parameters (application specific)

There are other lens parameters that are chosen to meet the needs of the vision application. These parameters are independent of the Genie model (assuming that the Lens Mount and Lens Sensor Size parameters are correct, as previously covered in this section). A vision system integrator or lens specialist should be consulted when choosing lenses since there is a trade off between the best lenses and cost. An abridged list of lens parameters follows – all of which need to be matched to the application.

- **Focal Length**: Defines the focus point of light from infinity. This parameter is related to the Genie mount (C or CS mount). See Camera Specifications — Back Focal Distance.
- **Field of View**: A lens is designed to image objects at some limited distance range, at some positive or negative magnification. This defines the field of view.
- **F-Number (aperture)**: The lens aperture defines the amount of light that can pass. Lenses may have fixed or variable apertures. Additionally the lens aperture affects Depth of Field which defines the distance range which is in focus when the lens is focus at some specific distance.
- **Image Resolution and Distortion**: A general definition of image quality. A lens with poor resolution seems to never be in focus when used to image fine details.
- **Aberrations (defect, chromatic, spherical)**: Aberrations are specific types of lens faults affecting resolution and distortion. Lens surface defects or glass faults distort all light or specific colors. Aberrations are typically more visible when imaging fine details.
- **Spatial Distortions**: Describes non-linear lens distortions across the field of view. Such distortion limits the accuracy of measurements made with that lens.

Optical Considerations

This section provides an overview to illumination, light sources, filters, lens modeling, and lens magnification. Each of these components contribute to the successful design of an imaging solution.

Illumination

The amount and wavelengths of light required to capture useful images depend on the particular application. Factors include the nature, speed, and spectral characteristics of objects being imaged, exposure times, light source characteristics, environmental and acquisition system specifics, and more. The Teledyne DALSA Web site, http://mv.dalsa.com/, provides an introduction to this potentially complicated issue. Click on Knowledge Center and then select Application Notes and Technology Primers. Review the sections of interest.

It is often more important to consider exposure than illumination. The total amount of energy (which is related to the total number of photons reaching the sensor) is more important than the rate at which it arrives. For example, $5\mu J/cm^2$ can be achieved by exposing $5mW/cm^2$ for 1ms just the same as exposing an intensity of $5W/cm^2$ for $1\mu s$.

Light Sources

Keep these guidelines in mind when selecting and setting up light source:

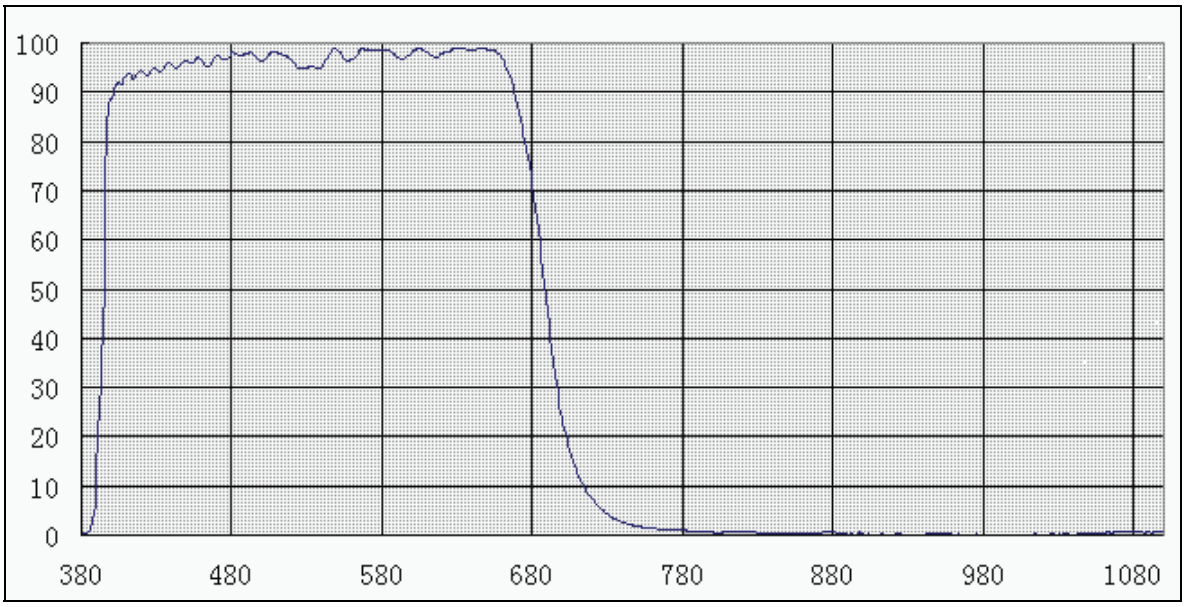
- LED light sources are relatively inexpensive, provide a uniform field, and longer life span compared to other light sources. However, they also require a camera with excellent sensitivity.
- Halogen light sources generally provide very little blue relative to infrared light (IR).
- Fiber-optic light distribution systems generally transmit very little blue relative to IR.
- Some light sources age such that over their life span they produce less light. This aging may not be uniform—a light source may produce progressively less light in some areas of the spectrum but not others.

IR Cutoff Filters

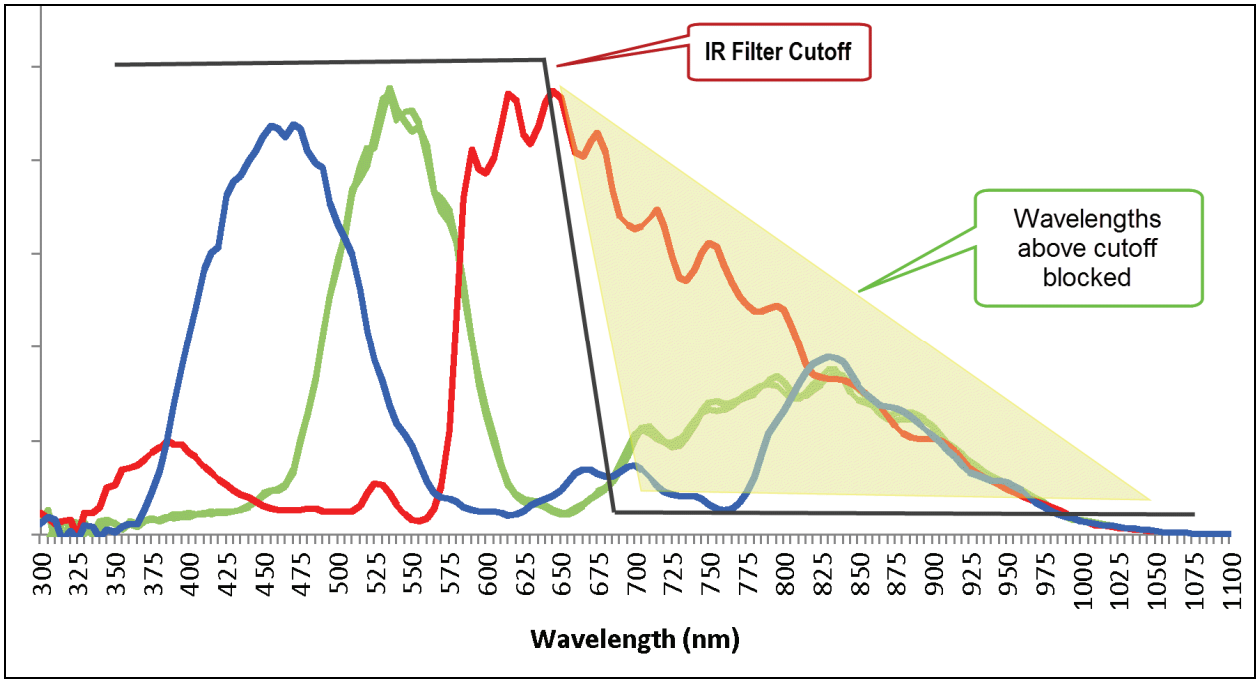
Genie TS cameras are responsive to near infrared (IR) wavelengths. To prevent infrared from distorting the color balance of visible light acquisitions, use a "hot mirror" or IR cutoff filter that transmits visible wavelengths but does not transmit near infrared wavelengths and above.

All models of Genie TS color cameras have a spectral response that extends into near IR wavelengths (as defined for each sensor model in the sensor specification descriptions). Images captured will have washed out color if the sensor response is not limited to the visible light band.

The following graphics shows the transmission response of typical filters designed for CMOS sensor cameras. When selecting an IR cutoff filter, choose a near infrared blocking specification of ~650nm. Filters that block at 700nm or longer wavelengths, designed for CCD cameras, are not recommended for Genie TS color cameras.



The graphic below shows a sample response of a Genie TS color camera with an overlay of a cutoff filter suppressing wavelengths above 650nm from reaching the camera sensor.

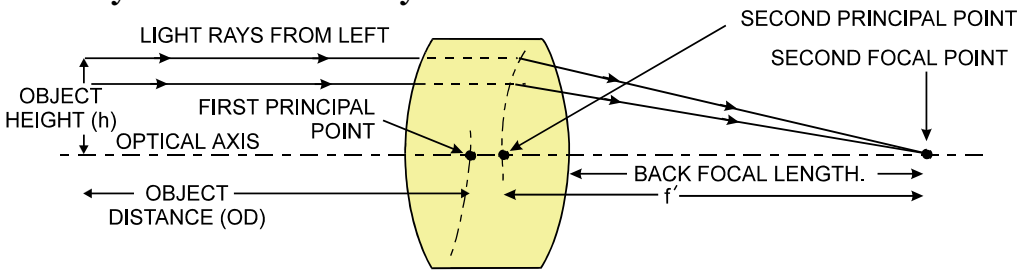


Lens Modeling

Any lens surrounded by air can be modeled for camera purposes using three primary points: the first and second principal points and the second focal point. The primary points for a lens should be available from the lens data sheet or from the lens manufacturer. Primed quantities denote characteristics of the image side of the lens. That is, h is the object height and h′ is the image height.

The focal point is the point at which the image of an infinitely distant object is brought to focus. The effective focal length (f′) is the distance from the second principal point to the second focal point. The back focal length (BFL) is the distance from the image side of the lens surface to the second focal point. The object distance (OD) is the distance from the first principal point to the object.

Primary Points in a Lens System



Magnification and Resolution

The magnification of a lens is the ratio of the image size to the object size:

$m = \frac{h'}{h}$	Where m is the magnification, h′ is the image height (pixel size) and h is the object height (desired object resolution size).

By similar triangles, the magnification is alternatively given by:

$m = \frac{f'}{OD}$

These equations can be combined to give their most useful form:

$\frac{h'}{h} = \frac{f'}{OD}$	This is the governing equation for many object and image plane parameters.

Example: An acquisition system has a 512 x 512 element, 10□m pixel pitch area scan camera, a lens with an effective focal length of 45mm, and requires that 100μm in the object space correspond to each pixel in the image sensor. Using the preceding equation, the object distance must be 450mm (0.450m).

$\frac{10\mu m}{100\mu m} = \frac{45mm}{OD}$	$OD = 450mm(0.450m)$

Sensor Handling Instructions

This section reviews proper procedures for handling, cleaning, or storing the Genie camera. Specifically the Genie sensor needs to be kept clean and away from static discharge to maintain design performance.

Electrostatic Discharge and the Sensor

Cameras sensors containing integrated electronics are susceptible to damage from electrostatic discharge (ESD).

Electrostatic charge introduced to the sensor window surface can induce charge buildup on the underside of the window that cannot be readily dissipated by the dry nitrogen gas in the sensor package cavity. With charge buildup, problems such as higher image lag or a highly non-uniform response may occur. The charge normally dissipates within 24 hours and the sensor returns to normal operation.

Important: Charge buildup will affect the camera's flat-field correction calibration. To avoid an erroneous calibration, ensure that you perform flat-field correction only after a charge buildup has dissipated over 24 hours.

Protecting Against Dust, Oil and Scratches

The sensor window is part of the optical path and should be handled like other optical components, with extreme care.

Dust can obscure pixels, producing dark patches on the sensor response. Dust is most visible when the illumination is collimated. The dark patches shift position as the angle of illumination changes. Dust is normally not visible when the sensor is positioned at the exit port of an integrating sphere, where the illumination is diffuse.

Dust can normally be removed by blowing the window surface using a compressed air blower, unless the dust particles are being held by an electrostatic charge, in which case either an ionized air blower or wet cleaning is necessary.

Oil is usually introduced during handling. Touching the surface of the window barehanded will leave oily residues. Using rubber finger cots and rubber gloves can prevent oil contamination. However, the friction between the rubber and the window may produce electrostatic charge that may damage the sensor.

Scratches can be caused by improper handling, cleaning or storage of the camera. When handling or storing the Genie camera without a lens, always install the C-mount protective cap. Scratches diffract incident illumination. When exposed to uniform illumination, a sensor with a scratched window will normally have brighter pixels adjacent to darker pixels. The location of these pixels changes with the angle of illumination.

Cleaning the Sensor Window

Even with careful handling, the sensor window may need cleaning. The following steps describe various cleaning techniques to clean minor dust particles to accidental finger touches.

- Use compressed air to blow off loose particles. This step alone is usually sufficient to clean the sensor window. Avoid moving or shaking the compressed air container and use short bursts of air while moving the camera in the air stream. Agitating the container will cause condensation to form in the air stream. Long air bursts will chill the sensor window causing more condensation. Condensation, even when left to dry naturally, will deposit more particles on the sensor.
- When compressed air cannot clean the sensor, Dalsa recommends using lint-free ESD-safe cloth wipers that do not contain particles that can scratch the window. The Anticon Gold 9”x 9” wiper made by Milliken is both ESD safe and suitable for class 100 environments. Another ESD acceptable wiper is the TX4025 from Texwipe.
- An alternative to ESD-safe cloth wipers is Transplex swabs that have desirable ESD properties. There are several varieties available from Texwipe. Do not use regular cotton swabs, since these can introduce static charge to the window surface.
- Wipe the window carefully and slowly when using these products.

Ruggedized RJ45 Ethernet Cables

Components Express Inc. has available an industrial RJ45 CAT6 cable that on one end has a molded shroud assembly with top/bottom thumbscrews, while the other end has a standard RJ45. This cable is recommended when Genie is installed in a high vibration environment. All Genie versions support this secure Ethernet cable.

All cables made in U.S.A. – all cables RoHS compliant.	CAT6 certified (tested for near end / far end crosstalk and return loss). IGE-3M (3meters) IGE-10M (10meters) IGE-25M (25meters) IGE-50M (50meters) IGE-100M (100meters)
For Information contact:	Components Express, Inc. (CEI) 10330 Argonne Woods Drive, Suite 100 Woodridge, IL 60517-4995 Phone: 630-257-0605 / 800.578.6695 (outside Illinois) Fax: 630-257-0603 http://www.componentsexpress.com/

Troubleshooting

Overview

In rare cases an installation may fail or there are problems in controlling and using the Genie camera. This section highlights issues or conditions which may cause installation problems and additionally provides information on computers and network adapters which have caused problems with Genie. Emphasis is on the user to perform diagnostics with the tools provided and methods are described to correct the problem.

The GigE Server status provides visual information on possible Genie problems. The three states are shown in the following table. Descriptions of possible conditions causing an installation or operational problem follow. Note that even a Genie installation with no networking issue may still require optimization to perform to specification.

	Device Not Available	Device IP Error	Device Available
GigE Server Tray Icon:			
Note: It will take a few seconds for the GigE Server to refresh its state after any change.	A red X will remain over the GigE server tray icon when the Genie device is not found. This indicates a network issue where there is no communication with Genie. ***Or in the simplest case,*** the Genie is not connected.	The GigE server tray icon shows a warning when a device is connected but there is some type of IP error.	The GigE server tray icon when the Genie device is found. The Genie has obtained an IP address and there are no network issues. Optimization may still be required to maximize performance.

Problem Type Summary

Genie problems are either installation types where the Genie is not found on the network or setup errors where the Genie device is found but not controllable. Additionally a Genie may be properly installed but network optimization is required for maximum performance. The following links jump to various topics in this troubleshooting section.

Device Not Available

A red X over the GigE server tray icon indicates that the Genie device is not found. This indicates either a major camera fault or condition such as disconnected power, or a network issue where there is no communication.

- Review the section "Using Genie TS " on page 29 to verify required installation steps.
- Refer to the Teledyne DALSA Network Imaging manual to review networking details.

- The Genie camera cannot acquire a DHCP address and/or the Windows firewall does not start after Windows XP Service Pack 2 or 3 has been installed. See "The Windows XP Firewall Service Can Not Start" on page 177.
- In multiple NIC systems where the NIC for the Genie is using LLA mode, ensure that no other NIC is in or switches to LLA mode. It is preferable that the Teledyne DALSA DHCP server is enabled on the NIC used with the Genie instead of using LLA mode, which prevents errors associated with multiple NIC ports.
- Verify that your NIC is running the latest driver available from the manufacturer.

Device IP Error

The GigE server tray icon shows a warning with IP errors. Review the following topics on network IP problems to identify and correct the condition.

Please refer to the Teledyne DALSA Network Imaging Package manual for information on the Teledyne DALSA Network Configuration tool and network optimization foe GigE Vision cameras and devices.

Multiple Camera Issues

- When using multiple cameras with a computer with multiple NIC ports, confirm each Genie has been assigned an IP address by checking the GigE server.
- To reduce network traffic in configured problem free systems, use the Network Configuration tool to stop camera discovery broadcasts. Refer to the Teledyne DALSA Network Imaging manual.
- When using multiple cameras connected to an VLAN Ethernet switch, confirm that all cameras are on the same subnet setup on that switch. See the Teledyne DALSA Network Imaging package manual for more information. .
- If a Genie camera installed with other GigE Vision cameras can not connect properly with the NIC or has acquisition timeout errors, there may be a conflict with the third party camera's filter driver. In some cases third party filter drivers modify the NIC properties such that the Teledyne DALSA Sapera Network Imaging Driver does not install. Verify such a case by uninstalling the third party driver and installing the Genie package again.
- Verify that your NIC is running the latest driver available from the manufacturer.

Device Available but with Operational Issues

A properly installed Genie with no network issues may still not perform optimally. Operational issues concerning cabling, Ethernet switches, multiple cameras, and camera exposure are discussed in the following sections:

Always Important

- Why should Genie firmware be updated? See "Firmware Updates" on page 178.
- "Power Failure During a Firmware Update–Now What?" on page 179.
- "Cabling and Communication Issues" on page 179.
- See "Preventing Operational Faults due to ESD" on page 28 to avoid random packet loss, random camera resets, and random loss of Ethernet connections.

No Timeout messages

- I can use CamExpert to grab (with no error message) but there is no image (display window stays black). See "Acquisition Error without Timeout Messages" on page 179.

- I can use CamExpert to grab (with no error message) but the frame rate is lower than expected. See "Camera acquisition is good but frame rate is lower than expected" on page 180.
- There is no image and the frame rate is lower than expected.
  See "Camera is functional but frame rate is lower than expected" on page 180.
- There is no image but the frame rate is as expected.
  See "Camera is functional, frame rate is as expected, but image is black" on page 180.

Other problems

- Unexpected 'Trigger Events'. See "Random Invalid Trigger Events" on page 180.

Verifying Network Parameters

Teledyne DALSA provides the Network Configuration tool to verify and configure network devices and the Genie network parameters. See section Network Configuration Tool of the Teledyne DALSA Network Imaging manual, if there were any problems with the automatic Genie software installation.

Before Contacting Technical Support

Carefully review the issues described in this Troubleshooting section. To aid Teledyne DALSA personnel when support is required, the following should be included with the request for support.

- From the Start menu, go to **Programs • Dalsa • Sapera LT • Tools** and run the **Log Viewer** program. From its File menu click on **Save Messages** to generate a log text file.
- Report the version of Genie TS Framework and Sapera version used.

Installation Issues and Functional Problems

This section covers issues that are apparent after installation or are indicated by the GigE server tray icon showing a warning symbol.

The Windows XP Firewall Service Can Not Start

After installing Windows XP Service Pack 2 or 3, the Windows Firewall service will not start. Problems with the Genie camera or Framework may include:

- The Genie camera cannot acquire a DHCP address
- Registry writes fail
- Messages in the Sapera Log Viewer include "check your firewall" and the computer firewall is disabled for no reason.

After installing Windows XP Service Pack 2 or 3, the Windows Firewall service will not start. Symptoms may include the following messages:

- When you click Windows Firewall in Control Panel, you may receive the following error message:
  Windows Firewall settings cannot be displayed because the associated service is not running. Do you want to start the Windows Firewall/Internet Connection Sharing (ICS) service?
- If you try to manually start the Windows Firewall service by using Services, you may receive the following error message:
  Could not start the Windows Firewall/Internet Connection Sharing (ICS) service on Local Computer.
  Error 0x80004015: The class is configured to run as a security id different from the caller.

These symptoms are described in detail by Microsoft support at this link (http://support.microsoft.com/kb/892199).

Without covering the details mentioned in the Microsoft support web page, the solution involves deleting two registry keys in the host computer. This procedure should only be done by someone comfortable with Windows registry backups and editing. These registry keys can be deleted via the following command console instructions:

- REG DELETE HKLM\SYSTEM\CurrentControlSet\Services\SharedAccess\Security /f
- REG DELETE HKLM\SOFTWARE\Classes\AppID\{ce166e40-1e72-45b9-94c9-3b2050e8f180} /f

Reboot the computer after execution.

Automatic Installation stalls when using Foreign Language Windows

With some foreign language Windows there is a problem where the installation of a required filter driver does not proceed automatically. Until this issue is resolved by Teledyne DALSA engineering, follow the instructions in Appendix A: Framework Installation Issues with Foreign Language Windows.

Device Available with Operational Issues

This section considers issues with cabling, Ethernet switches, multiple cameras, and camera exposure. All information concerning the Teledyne DALSA Network Configuration Tool and other networking considerations, is available in the **Teledyne DALSA Network Imaging manual**.

Firmware Updates

As a general rule any Genie installation must include the firmware update procedure (see "File Access Control Category" on page 146). Genie camera firmware that does not match a newer version of installed Genie Framework software is likely to have unpredictable behavior. Problems might be:

- Genie is not found by the device discovery process.
- Genie is found by the Sapera GigE Server but an application such as CamExpert does not see the camera.
- A Genie that had a fault with a firmware update will automatically recover by booting with the previous firmware version.

	Important: New Genie cameras installed in previously deployed systems are fully backward compatible with the older vision application.

Power Failure During a Firmware Update–Now What?

Don't panic! There is far greater chance that the host computer OS is damaged during a power failure than any permanent problems with the Genie. When electrical power returns and the host computer system has started, follow this procedure.

- Connect power to the Genie. The Genie processor knows that the firmware update failed.
- The Genie TS will boot with the previous version of firmware and will operate normally.
- Perform the firmware update procedure (see "File Access Control Category" on page 146) again.

Cabling and Communication Issues

With only two cables connected to Genie, possible cabling issues are limited.

Power supply problems:

- If the Genie status LED is off, the DC supply power is not connected or faulty. Verify the power supply voltage.

Communication Problems:

- Use a shielded cable where the connector shell electrically connects the Genie chassis to the power supply earth ground. This can eliminate trigger issues in a high EMI environment.
- Check that the Ethernet cable is clipped both to the Genie and the NIC or switch on the other end.
- Verify the Ethernet cabling. Poor cables will cause connections to auto-configure at lower speeds.
- Use a secured Ethernet cable when the Genie is in a high vibration environment. See "Ruggedized RJ45 Ethernet Cables" on page 173.
- Check the Ethernet status LEDs on the Genie RJ45 connector. The Link Status indicator is on and the activity LED should flash with network messages.
- Verify that the Ethernet cable is CAT5e or CAT6. This is very important with long cable lengths.
- When using very long cables, up to the maximum specified length of 100m for gigabit Ethernet, different NIC hardware and EMI conditions can affect the quality of transmission.
- Minimum recommended Ethernet cable length is 3 feet (1 meter).
- Use the Log Viewer tool (see point below) to check on packet resend conditions.
- Run the Sapera Log Viewer: **Start•Programs•Teledyne DALSA•Sapera LT•Tools•Log Viewer**. Start the Genie acquisition program, such as CamExpert. There should not be any "packet resend" messages, else this indicates a control or video transmission problem due to poor connections or extremely high EMI environments.

Acquisition Error without Timeout Messages

Streaming video problems range from total loss of image data to occasional loss of random video data packets. The following section describes conditions identified by Teledyne DALSA engineering while working with Genie in various computers and setups. See the Teledyne DALSA Network Imaging manual for information on network optimizations.

No camera exposure when expected

- Verify by using the camera in free-running mode. Do not use external trigger mode when testing a camera setup.

- If using free-running mode, verify that the exposure period is set to the maximum possible for the set frame rate.
- Load factory default from the Power-up Configuration in CamExpert. This will reset the camera to its nominal acquisition rate.

Camera is functional but frame rate is lower than expected

- Verify Ethernet link speed. If the LAN connection is limited to 100 Mbps, the Genie TS frame rate maximum will be limited once the internal buffers are filled. See the Teledyne DALSA Network Imaging manual for information on network optimizations.
- If using an external trigger, verify the trigger source rate and Genie parameters such as trigger to exposure delay.
- Verify the exposure mode type is Synchronous, not Reset mode. (See "Synchronization Timing" on page 57).

Camera acquisition is good but frame rate is lower than expected

- While running CamExpert and grabbing in free-run mode at the maximum frame rate, start the **Sapera Monitor** tool from the Sapera Tools installed with Sapera.
- Make sure the **Memory Overflow** event monitor is enabled.
- Continue grabbing from the Genie at maximum frame rate. If any memory overflow events are counted, then the Genie internal buffer could not be transmitted on time and was discarded. Such a condition may occur with large frame color or high frame rate Genie cameras.
- Note that the Sapera CamExpert tool has limits to the maximum frame rate possible due to CamExpert generating an interrupt for each acquired frame. The Sapera Grab Demo may be better suited for testing at higher frame rates.
- Verify that network parameters are optimal as described in the Teledyne DALSA Network Imaging Module manual. Ensure the host computer is not executing other network intensive tasks. Try a different Gigabit NIC.
- Note that a changed acquisition frame rate becomes active only when the acquisition is stopped and then restarted.

Camera is functional, frame rate is as expected, but image is black

- Verify that the lens iris is open.
- Aim the Genie at a bright light source.
- Check that the programmed exposure duration is not too short or set it to maximum. See "Sensor Control Category" on page 46.
- Using CamExpert set the Genie to output its Internal Pattern Generator. This step is typically done for any camera installation to quickly verify the Genie and its software package. See "Internal Test Image Generator" on page 117 for information on using CamExpert to select internal patterns from Genie.

Other Problems or Issues

This section describes problems that do not fit any of the categories above. Typically these are issues found in the field under specific or unusual conditions.

Random Invalid Trigger Events

Do not change the exposure time while grabbing, else an Invalid Trigger Event may be generated. This applies to any exposure mode or trigger source. The Invalid Trigger Event is not catastrophic and only indicates the loss of a video frame. Stopping acquisitions first will avoid this error.

Minimum Sapera Version Required

Save User Configuration Failed: An unusual error that occurred with no other Genie control problem. The solution is to verify the minimum Sapera version used with the Genie Framework. The Genie TS requires Sapera version 7.20 or later (use Sapera LT version 7.50 or later for decoding acquisitions by the JPEG firmware design).

Issues with Cognex VisionPro

When the Cognex VisionPro package is uninstalled, the Genie TS becomes not available within CamExpert due to the Cognex uninstaller removing GigE Vision components. This forces a Genie TS user to reinstall the framework package.

Cognex VisionPro remains a useable third party product except for their uninstaller fault. Genie TS users just need to account for this issue until resolved by Cognex.

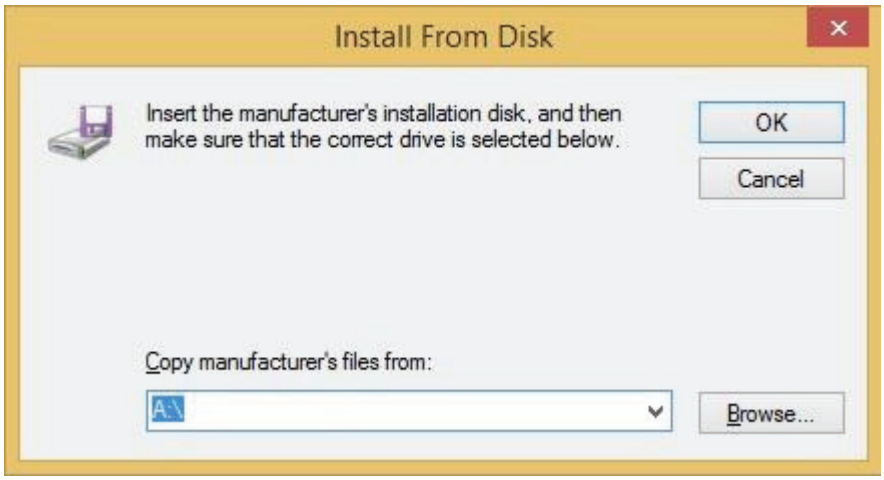
Appendix A: Framework Installation Issues with Foreign Language Windows

With some foreign language Windows there is a problem where the installation of a required filter driver does not proceed automatically. Until this issue is resolved by Teledyne DALSA engineering, a user needs to follow the instructions below to complete the installation.

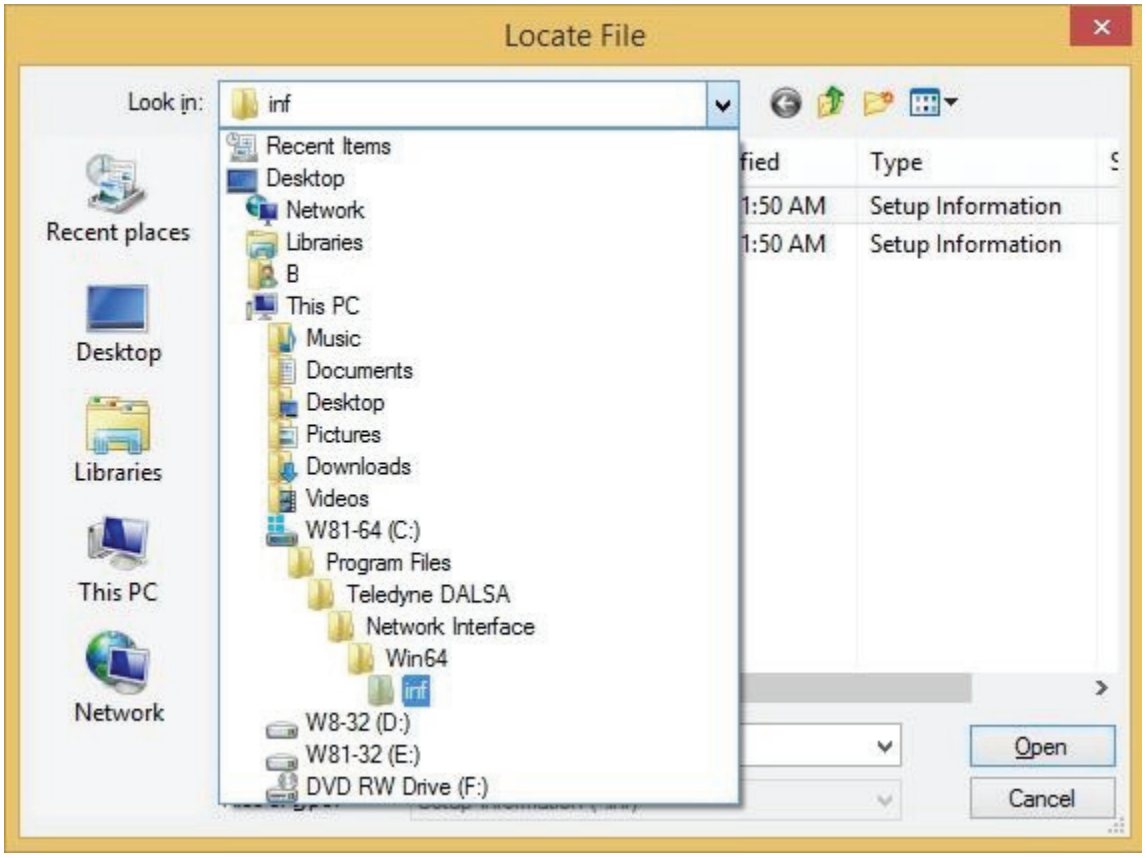
- If the installation sequence stops with this message window just click on the Have Disk button.

Select Network Service
Click the Network Service that you want to install, then click OK. If you have an installation disk for this feature, click Have Disk.
Network Service:
Virtual WiFi Filter Driver
This driver is digitally signed.
Tell me why driver signing is important
Have Disk...
OK
Cancel

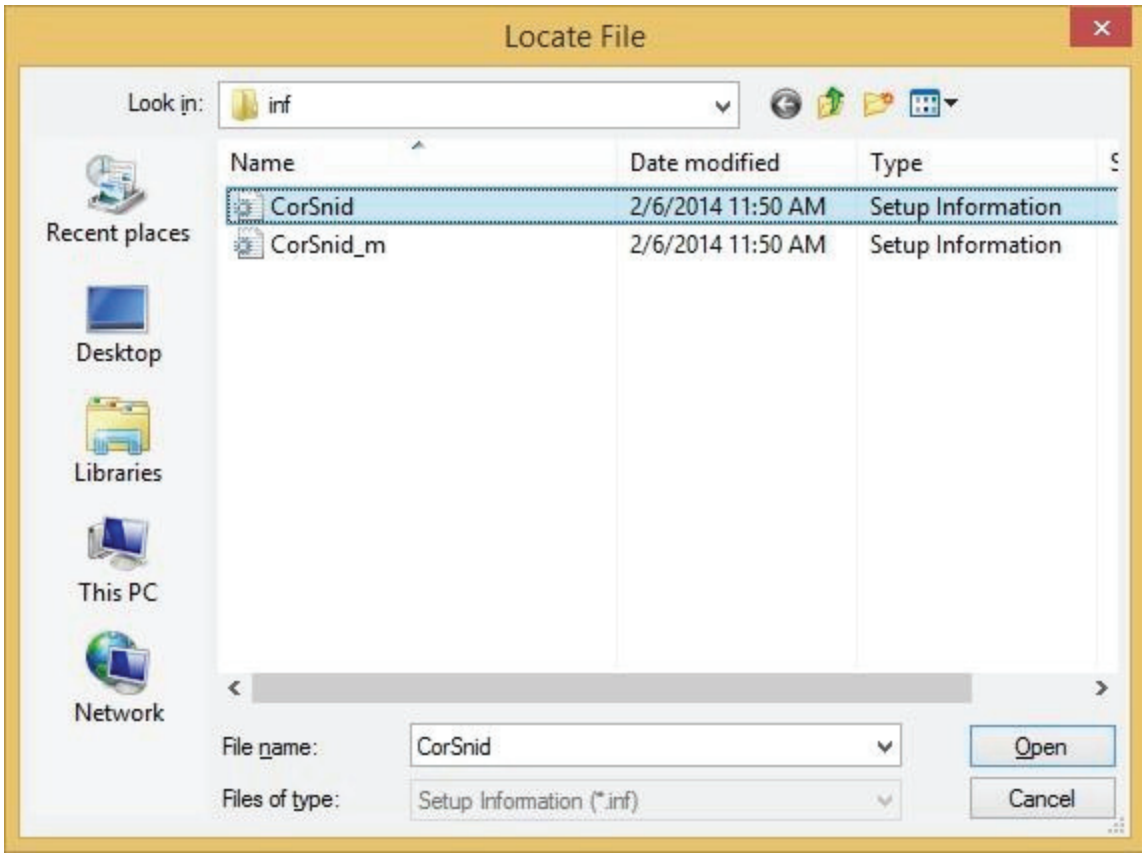
- On the next menu, click Browse. Note that no external disk is required.



- Select the local directory as shown in the following dialog. Note that this image is for a Windows 64 installation. When using a Windows 32 computer, the folder path is ..\Win32\inf.



- Within the 'inf' folder, select the "CorSnid" file and click the Open button. Ignore any other file.



- Click OK to accept this file.

Install From Disk
Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.
OK
Cancel
Copy manufacturer's files from:
C:\Program Files\Teledyne DALSA\Network Interfa
Browse...

- Finally select and click OK to load the driver "Teledyne DALSA Sapera Network Imaging Driver".

Select Network Service
Click the Network Service that you want to install, then click OK.
Network Service:
Teledyne DALSA Sapera Network Imaging Driver
This driver has an Authenticode(tm) signature.
Tell me why driver signing is important
OK
Cancel

- After this step the installation will progress automatically as is normal with the English version of Windows.
- These manual steps by the user in no way affect the installation, but are simply a workaround to how the foreign language Windows currently handle the Teledyne DALSA installation script.

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Technical Support

Submit any support question or request via our web site:

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